SAMSUNG

ELECTRONICS

TRAINING MANUAL

VP-D93(I)

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SAMSUNG

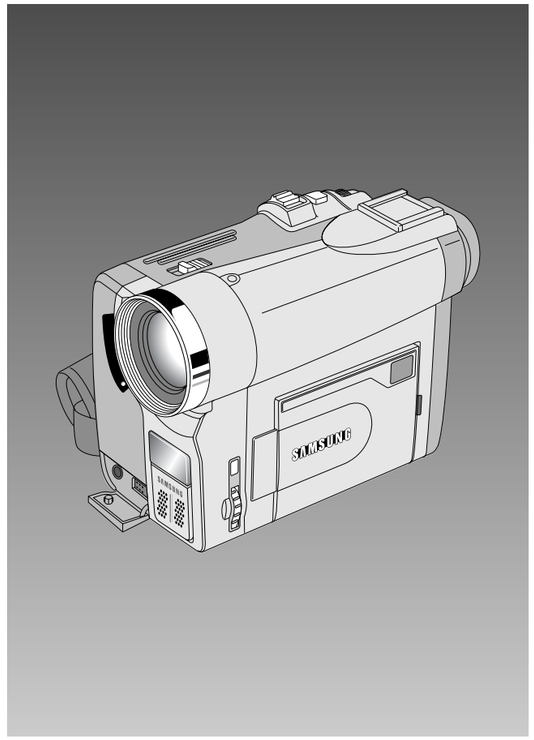
DIGITAL VIDEO CAMCORDER

Chassis : Omega
VP-D93(I)

PAL

TRAINING Manual

DIGITAL VIDEO CAMCORDER



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5. Alignment and Adjustment

5-1 VCR Adjustment

5-1-1 VCR Adjustment Preparation

1) How to get into the VCR adjust mode

STEP 1

❶ Connect the power source.
❷ Set the power switch to “PLAYER” position.

STEP 2

❶ Press and hold the "STOP" and "MEMORY MIX" buttons on the video camera at the same time for more than 5 seconds.
❷ When monitor OSD appears as shown Fig. 5-2, the adjustment mode has been activated successfully.
❸ Move the “MENU Selector” to highlight VCR ADJ and push the “MENU Selector”. (See Fig. 5-3)
❹ When changing the adjustment item, please press the “EASY” and “DISPLAY” buttons on the video camera.
❺ You can change the adjustment value to move the “MENU Selector” Up or Down.
❻ After setting adjustment value, please push the “MENU Selector” to confirm Data.

STEP 3

If you want to finish the adjustment mode, you have to do Power Reset.
The Power Reset means that you pull out the power source and pull in it again.

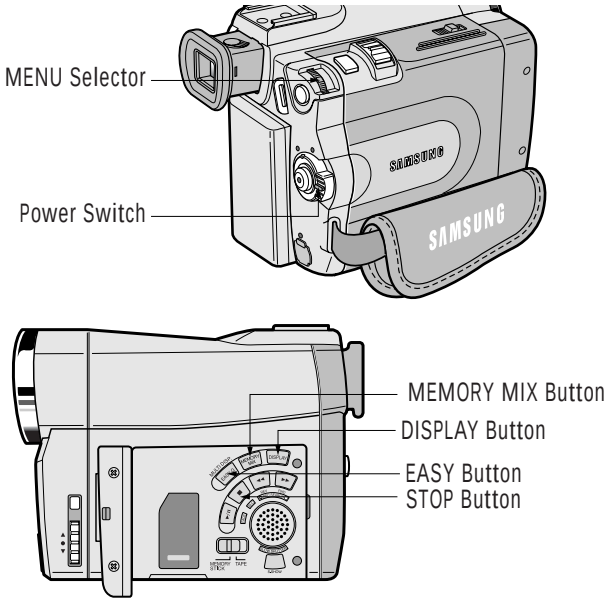


Fig. 5-1

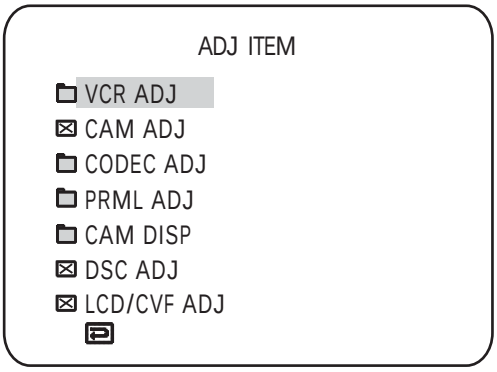


Fig. 5-2

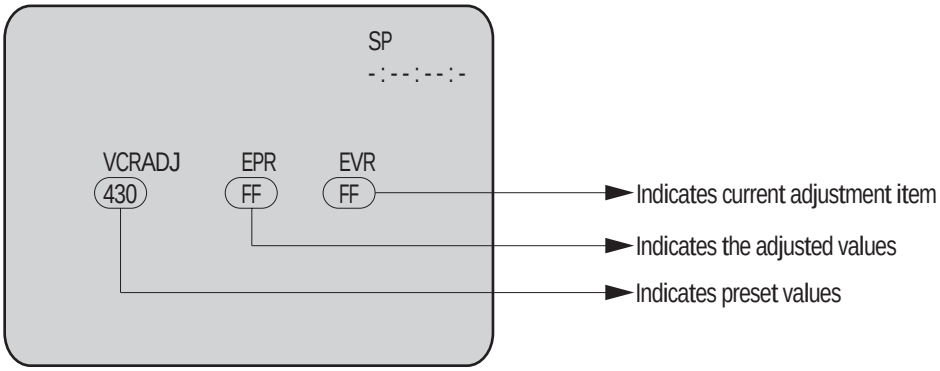


Fig. 5-3

2) Function of each buttons on the SET Key

<Table 5-1>

Buttons	Description
MENU Selector push (Confirm)	Stores changed value in the adjustment and auto adjustment mode.
MENU Selector down (Data Down)	Changes data in the adjustment state.
MENU Selector up (Data Up)	
EASY (Mode Up)	Changes mode (address).
DISPLAY (Mode Down)	

5-1-2 VCR Adjustment

1) How to get into the VCR adjust mode

<Table 5-2>

Mode(Address)	Name	Value	Description
002	Model Adjust	AB	Model (FIX)
003	Model Adjust	7E	Model (FIX)
006	Model Adjust	03	Model (FIX)
007	SWP Position	80	Head Switching Position Adjust

2) How to adjust Head Switching Position

❶ Get into VCR ADJUST mode.
❷ Move to the VCR ADJUST address “007”.
❸ Play standard tape, and “Head Switching Position” will be adjusted automatically.

5-2 Camera Adjustmant

Note : How to adjust the camera system.

1) EEPROM stores confirmed adjustment value of each adjustment step.

2) DSP (Digital Signal Process : ICP11-Camera Main PCB) digitalizes the camera signal.

3) When changing ICP09-CAMERA Main PCB of EEPROM, readjust Main PCB.
While changing LCD PCB and CVF PCB- always readjust each part.
Since EEPROM stores confirmed adjustment value of each adjustment step, readjusting must be performed in order to store the changed data.

4) Adjust the following items after changing LENS Ass'y.
- **❶ Lens Zoom Track**
- **❷ Auto HALL**
- **❸ Auto IRIS**

5) Adjust the following items after changing EEPROM and Camera Main PCB.
- **❶ Lens Zoom Track**
- **❷ Zoom VR Center**
- **❸ Auto HALL**
- **❹ Auto IRIS**
- **❺ Auto White Balance (indoor)**
- **❻ Auto White Balance (outdoor)**

5-2-1 Adjustment Preparation

1) Measuring Instrument
- ❶ DC power supply
- ❷ Oscilloscope
- ❸ NTSC Vectorscope, PAL vectorscope
- ❹ NTSC wave form monitor, PAL wave form monitor
- ❺ NTSC TV or Monitor, PAL TV or Monitor
- ❻ Color bar chart
  Gray scale chart

2) Camera PCB configuration
- ❶ Main PCB
- ❷ CCD PCB
- ❸ Front PCB
- ❹ LCD PCB
- ❺ CVF PCB

3) Before you start
- ❶ Use the buttons on the SET key when adjusting camera.
- ❷ Press the push the "MENU Selector" when storing confirmed adjustment value of each adjustment step in EEPROM.
- ❸ The OSD shows "OK" after finishing each adjustment step.
- ❹ To clear the adjustment mode, pull out the power source.

4) Function of each buttons on the SET Key

<Table 5-3>

Buttons	Description
MENU Selector push (Confirm)	Stores changed value in the adjustment and auto adjustment mode.
MENU Selector down (Data Down)	Changes data in the adjustment state.
MENU Selector up (Data Up)	
EASY (Mode Up)	Changes mode.
DISPLAY (Mode Down)	

5) How to set up the camera adjustment mode

STEP 1

❶ Connect the power source (battery/DC cable).
❷ Set the power switch to "CAM" position.
❸ The OSD appears.

STEP 2

❶ Press and hold the "STOP" and "MEMORY MIX" buttons on the video camera at the same time for more than 5 seconds.
❷ When monitor OSD appears as shown Fig. 5-5, the adjustment mode has been activated successfully.
❸ Move the “MENU Selector” to highlight CAM ADJ and push the “MENU Selector”.
❹ When changing the adjustment item, please press the “EASY” button on the Camera.
❺ You can change the adjustment value to move the “MENU Selector” Up or Down.
❻ After setting adjustment value, please push the “MENU Selector” to confirm Data.

STEP 3

Monitor OSD shows " CAMERA ADJ OCD ". EPR : FF EVR : FF
Then camera adjustment mode has been activated successfully.

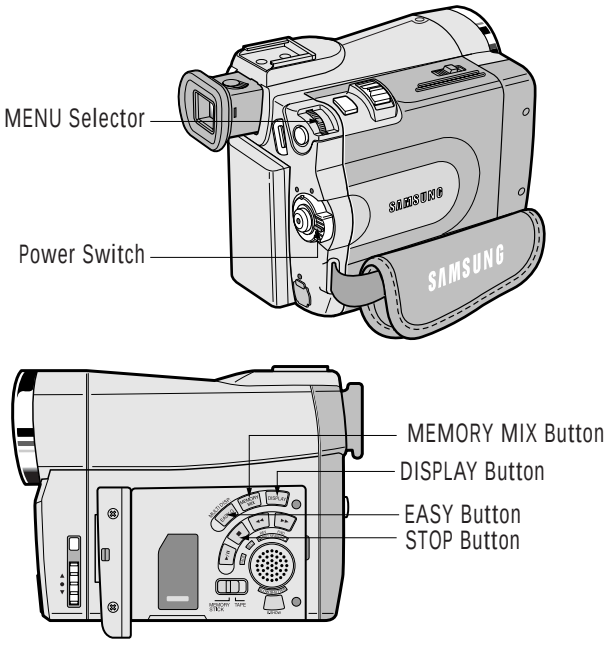


Fig. 5-4

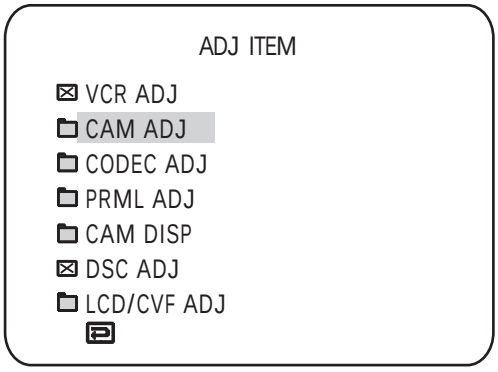


Fig. 5-5

5-2-2 Camera Adjustment

Note : "XX XX" indicate the previous preset value and adjusted value.
Press the “MENU Selector” (Confirm) to store the adjusted value.

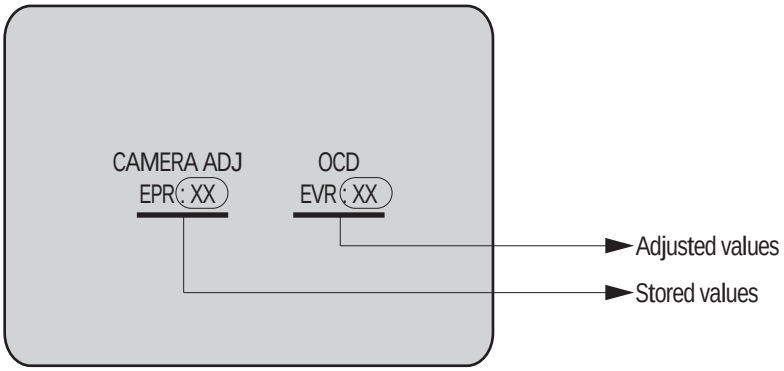


Fig. 5-6

1) EEPROM Data Initialize

Caution : This adjustment must do following items changing new EEPROM (IC705) or VCR Main PCB.

❶ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows “ODF XX XX”.
❷ Using “MENU Selector”(Data Up/Down) so that display data of EVR is “A0”
❸ Press the “MENU Selector” (Confirm).
❹ The OSD shows “OK” after huithing the initalize.

2) Lens Zoom Track

Caution : For whole zoom range, it shall be in focus.
The location of a focus lens is moving depending on the location of Zoom Lens.
During adjusting, micom measures the focus location from a near distance to a long.

❶ Camera is set to E-E mode.
❷ Focus chart photo.
❸ Ensure that camera is left an about 3m distance from a focus chart and the focus of lens is placed vertically.
Attach a focus chart to white or gray wall of a flat surface.
❹ Connect a video output terminal to a TV.
❺ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows "ODE XX XX".
❻ Press the “MENU Selector” (Confirm).
Never impact on the lens when adjusting zoom and focus Lens.
The OSD shows “OK” after finishing the adjustment.

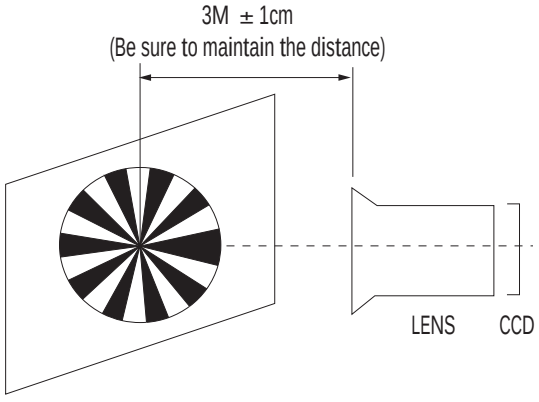


Fig. 5-7

3) Zoom VR Center

❶ Connect a video output terminal to a TV.
❷ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows “OD6 XX XX”.
❸ Press the “MENU Selector” (Confirm).
❹ Then Micom finds out Zoom VR center position.
Store Zoom VR center value in OB7.

4) Auto HALL

❶ Connect a video output terminal to a TV.
❷ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows "OCD XX XX".
❸ Press the “MENU Selector” (Confirm).
❹ Then micom finds out max. Hall value with an iris opened and min. Hall value with an iris closed.
Store max. and min. value of Hall in OAD and OAC respectively.
❺ The OSD shows “OK” after finishing the adjustment.

5) Auto IRIS Level

❶ Connect a video output terminal to a wave form monitor and a TV.
❷ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows "OCE XX XX".
❸ Press the “MENU Selector” (Confirm).
❹ Then micom finds out max. Hall value with an iris opened and min.
Hall value with an iris closed. Store max. and min. value of in OBC, OBD and OBB respectively.
❺ The OSD shows “OK” after finishing the adjustment.

6) Auto White Balance (indoor)

❶ Camera mode & 3100˚ K/5100˚ K gray scale chart.
❷ Connect a video output terminal to a vectorscope and a TV.
❸ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows "OD4 XX XX".
❹ Ensure that camera picks up image 40μs on 3100˚K gray scale chart precisely and the illumination is 1500~2000 Lux.
❺ Press the “MENU Selector” (Confirm) to ensure that white spot on a vectorscope is moving in the middle of screen.
❻ The OSD shows “OK” after finishing the adjustment.

7) Auto White Balance (outdoor)

❶ Camera mode & 3100˚ K/5100˚ K gray scale chart.
❷ Connect a video output terminal to a vectorscope and a TV.
❸ Press the “EASY”(Mode Up)/”DISPLAY”(Mode Down) buttons so that OSD shows "OD5 XX XX".
❹ Ensure that camera picks up image 40 μs on 5100 gray scale chart (3100 gray scale chart + C16 filter) precisely and the illumination is 1500~2000 Lux.
❺ Press the “MENU Selector” (Confirm) to ensure that white spot on a vectorscope is moving in the middle of screen.
❻ The OSD shows “OK” after finishing the adjustment.

5-3 LCD Adjustmant

Note : For LCD adjustment, use the buttons on the video camera and the SET key.
After each adjustment step is completed, OSD shows "OK".
EEPROM(ICL202) stores confirmed adjustment value of each adjustment step.
After finishing the adjustment, turn power off.

5-3-1 How to get into the LCD adjust mode

STEP 1

❶ Connect the power source (battery/DC cable).
❷ Set the power switch to "CAM" position.
❸ Camera screen and OSD appears.
❹ Open housing of the video camera and remove tape.
❺ Open the LCD.

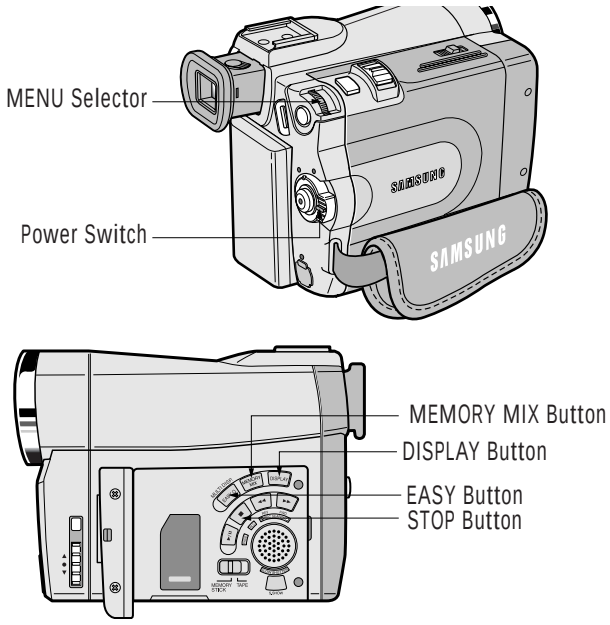


Fig. 5-8

STEP 2

❶ Press and hold the "STOP" and "MEMORY MIX" buttons on the video camera at the same time for more than 5 seconds.
❷ When monitor OSD appears as shown Fig. 5-9, the adjustment mode has been activated successfully.
❸ Move the “MENU Selector” to highlight LCD/CVF ADJ and push the “MENU Selector”.
❹ When changing the adjustment item, please press the “EASY”/”DISPLAY” buttons on the camera.
❺ You can change the adjustment value to move the “MENU Selector” Up or Down.
❻ After setting adjustment value, please push the “MENU Selector” to confirm Data.

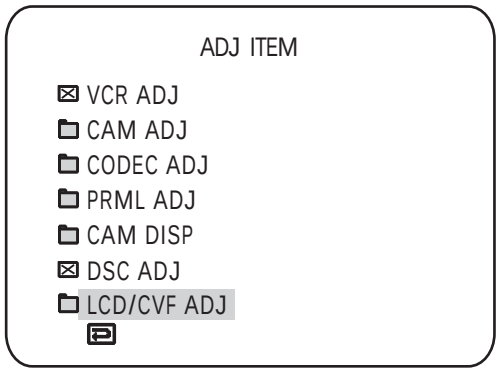


Fig. 5-9

5-3-2 Function of each buttons on the SET Key

<Table 5-4>

Buttons	Description
MENU Selector push (Confirm)	Stores changed value in the adjustment and auto adjustment mode.
EASY (Mode Up)	Shift adjustment address to left.
DISPLAY (Mode Down)	Shift adjustment address to right.
MENU Selector up (Data Up)	Up value.
MENU Selector down (Data Down)	Down value.

Note : In service adjustment mode, button names are different from those in customer function control mode.

5-3-3 Adjust Mode

<Table 5-5>

SYSTEM / Address	NTSC		PAL	
	123K LCD	211K LCD	123K LCD	211K LCD
00	55	55	55	55
01	A5	01	A5	03
02	45	00	45	00
03	41	00	41	00
04	98	00	A0	00
05	20	16	17	16
06	49	8A	4B	8A
07	1B	00	1B	00
08	1B	84	1B	84
09	D3	30	D3	30
0A	40	00	40	00
0B	34	B2	34	B2
0C	4A	90	40	90
0D	CE	A0	CE	A0
0E	35	B4	35	B4
0F	17	74	17	74
10	E8	75	E8	75
11	09	00	09	00
12	23	00	23	00
13	04	6A	05	6A
14	00	5F	00	5F
15	0C	C2	10	C2
16	00	88	00	88
17	-	60	-	60
18	-	7F	-	7F
19	-	81	-	88
1A	-	6A	-	6A
1B	-	00	-	00
1C	-	03	-	03
1D	-	82	-	82
1E	-	02	-	02
1F	-	02	-	02
20	-	70	-	70
21	-	07	-	07
22	-	03	-	03

5-4 Deck Adjustmant

5-4-1 Operation Without Housing Assembly

1) Remove the Housing Ass'y from the recorder unit.
2) Connect the mechanical chassis to the recorder circuit to supply voltage.
3) Set to Unload mode.
4) Press the S/W Push(Keep ON status)to start loading, and push the PLAY Key.
(Cover the Top/End sensor with black tape, because they do not operate.)

Note : For the removal of the Housing Ass'y refer to the Training Manual (page 4-7).

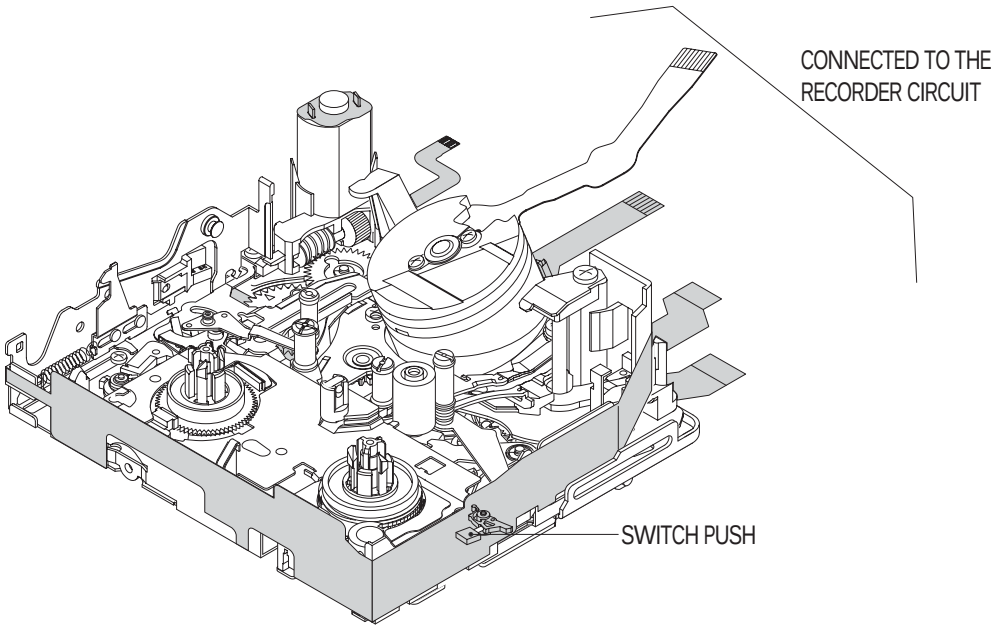


Fig. 5-10

5-4-2 Setting Mechanical Mode (Without Recorder Circuit)

1) Set the power-supply output to approx.3V.
2) Choose the polarity (depending on whether loading or unloading).
3) Supply the voltage to the Motor Loading, and set to the desired mode.

<Table 5-6>

A	B	Movement of chassis
+	-	Loading
-	+	Unloading

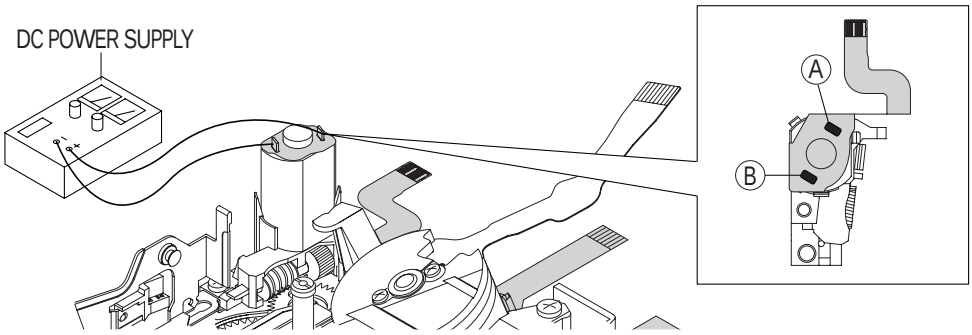


Fig. 5-11

5-4-3 Maintenance

Carry out the following periodic maintenance checks in order to fully exercise all functions, operations and tape. After repairing, service the set as follows:

1) Cleaning of Drum Assembly

❶ Gently apply lens tissue soaked in ethyl alcohol to the Drum assembly.
Clean the Upper Drum assembly while rotating it slowly counterclockwise(by hand).

Note : Do not rotate the motor by power or rotate the Upper Drum assembly clockwise.
Also, the Head tip will be damaged if the lens tissue is moved in a perpendicular direction.
Be sure to follow these instructions when cleaning the Drum Ass'y

2) Cleaning of Tape Path

❶ In EJECT mode, clean the tape path system(from Pole Tension P1 through Pole Review P7, Pinch Roller and Capstan Shaft) and the Lower Drum. Using the lens tissue soaked in ethyl alcohol.

Note : Make sure that no oil or grease adheres to the lens tissue.

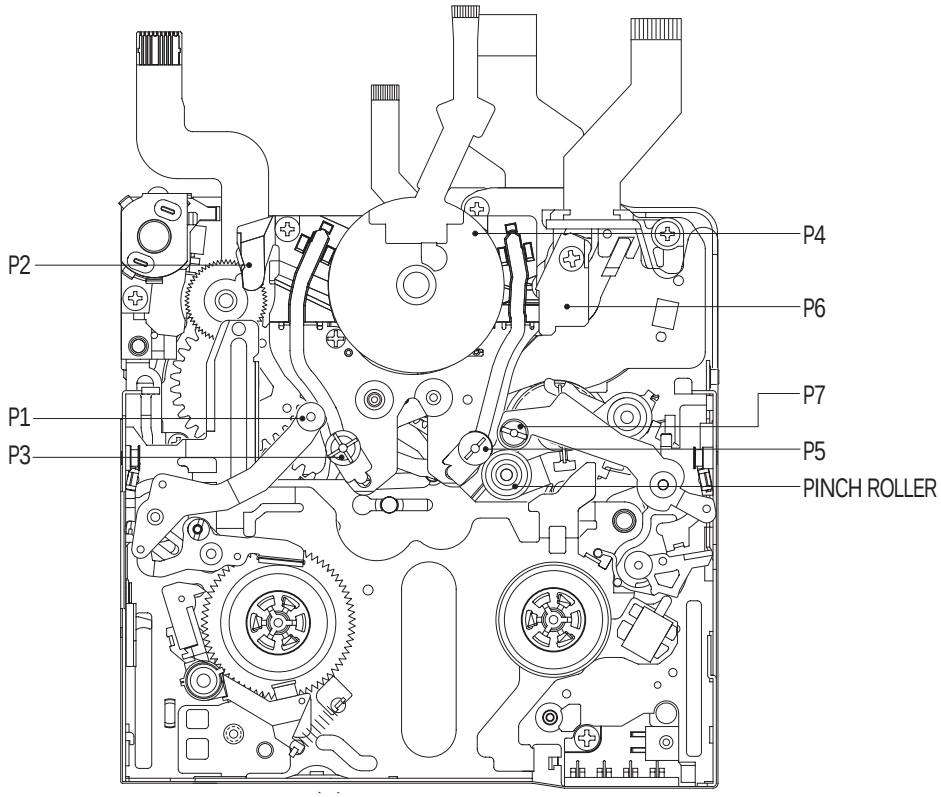


Fig. 5-12

3) Periodic Maintenance and Check List

When overhauling, refer to the following table.

<Table 5-7>

Maintenance checks		Hours of use (H)										Remark
		500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Tape path system	Cleaning of tape path	O	O	O	O	O	O	O	O	O	O	
	Cleaning and degaussing of drum ass'y	O	O	O	O	O	O	O	O	O	O	
DRIVING SYSTEM	Capstan Shaft		Δ		Δ		Δ		Δ		Δ	- Never let oil get on to the tape path surface.
	Gear Capstan		Δ		Δ		Δ		Δ		Δ	
	Gear Pully Shaft		Δ		Δ		Δ		Δ		Δ	
	Belt Timing		◆		◆		◆		◆		◆	
	Motor Loading		◆		◆		◆		◆		◆	
Perform-ance	Abnormal Noise		◆	◆	◆	◆	◆	◆	◆	◆	◆	
Confir-mation	Back Tension		◆		◆		◆		◆		◆	
	Brake System		◆		◆		◆		◆		◆	
	PB, REV Torque Measurement		◆		◆		◆		◆		◆	

O : Cleaning Δ : COil ◆ : Confirmation

- ◆ When lubrication bearings, be sure to keep the oil free of dust. (Oil contaminated with dust might cause the bearings to wear out or seize.)
- ◆ A "drop"of oil is defined as the amount attached to the tip of a Ø 2mm stick as shown in Fig. 5-13.

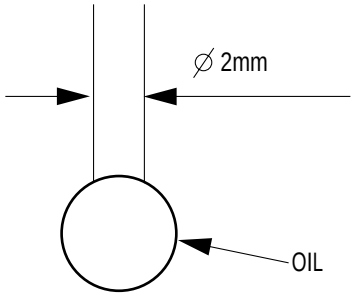


Fig. 5-13

5-4-4 Mechanical Check and Adjustment

5-4-4(a) Tension Regulator Adjustment

1) Disassembly

❶ For the removal of the Housing Ass'y refer to the Training Manual (page 4-7).

2) Adjustment

❶ Set to PLAY mode (without cassette tape).
❷ Check that the distance between external surface of Holder Loading and center of Arm Tension is 0~1mm. (Fig. 5-14)
❸ If necessary, proceed to step 4.
❹ If the Arm Tension is located inside the position specified, adjust the Band Adjust Tension toward arrow A. (If it is located outside, adjust toward arrow B.)

Note : Check if the Arm Tension can be moved toward arrow C in PB mode.

3) Reassembly

❶ For the removal of the Housing Ass'y refer to the Training Manual (page 4-7).

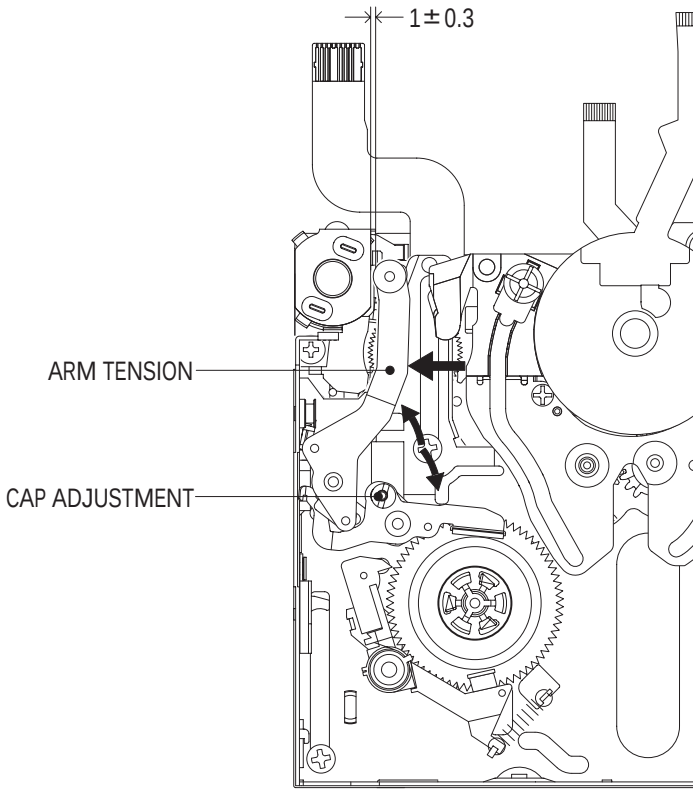


Fig. 5-14

5-4-2(b) Back Tension Confirmation

1) Set up the cassette-torque tape.
2) Set to CAMERA mode, push the EDIT(+) KEY and check that the torque value of Reel S is 4.5±0.5g.cm.

5-4-3(c) PB/REV Torque check

1) Set up the cassette torque tape.
2) Set to CAMERA mode, Push the EDIT(+)Key and check that the torque value of Reel T is 7.5±3g.cm.
3) Push the EDIT(-) Key and check that the torque value of Reel S is 12.5±3g.cm.
4) If necessary, replace the defective Gear pully Ass'y.

5-4-4(d) Reel Table Height Check

1) Removal

❶ For the removal of the Housing Ass'y refer to the Training Manual (page 4-7).
❷ For the removal of the Idler Ass'y refer to the Training Manual (page 4-8).

2) Check

❶ Using vernier calipers, check the following distances : From the upper surface of the PCB Reel to the resting surfaces of Reel S, T table should each be 3.9±0.1mm.

3) Mounting

❶ For the removal of the Idler Ass'y refer to the Training Manual (page 4-8).
❷ For the removal of the Housing Ass'y refer to the Training Manual (page 4-7).

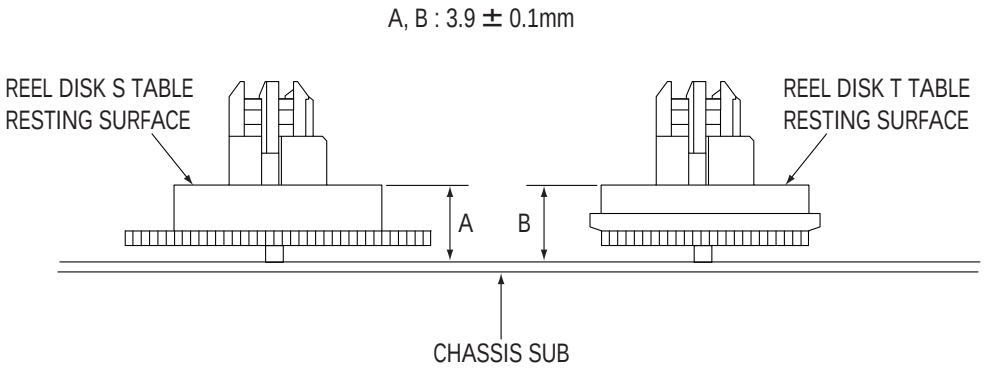


Fig. 5-15

5-4-5 Tape Path Adjustment

5-4-5(a) Preparation for Adjustment

❶ Clean the tape running surface(Poles, Drum, Capstan Shaft, Pinch Roller).
❷ Observe the PB RF signal and Head Switching Pulse on an oscilloscope.
❸ Play back the alignment tape.
❹ Check that the waveform of the RF signal is flatat both inlet and outlet(A in Fig. 5-16).
If not flat (B or C in Fig. 5-16), do adjustments 5-4-5(b) through 5-4-5(d).

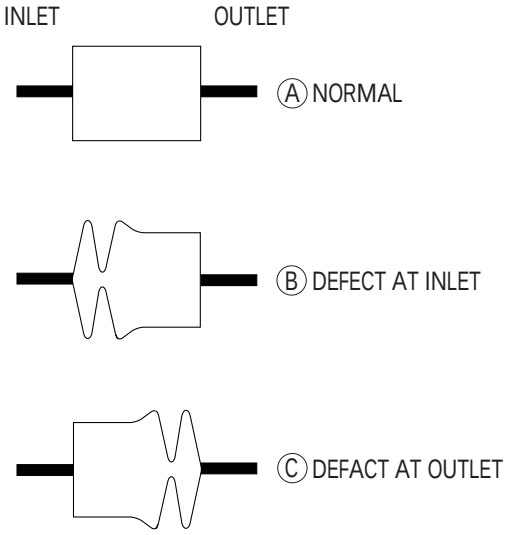


Fig. 5-16

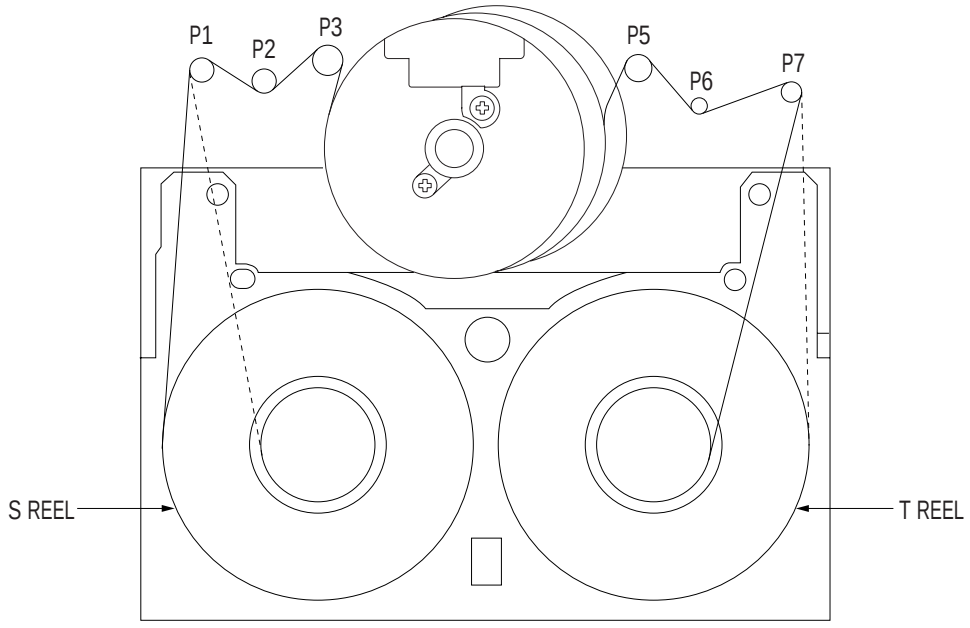


Fig. 5-17

5-4-5(b) Tracking adjustment

❶ Play Back the alignment tape.
❷ Turn P3 to flatten the waveform at the inlet.
❸ Turn P5 to flatten the waveform at the outlet.

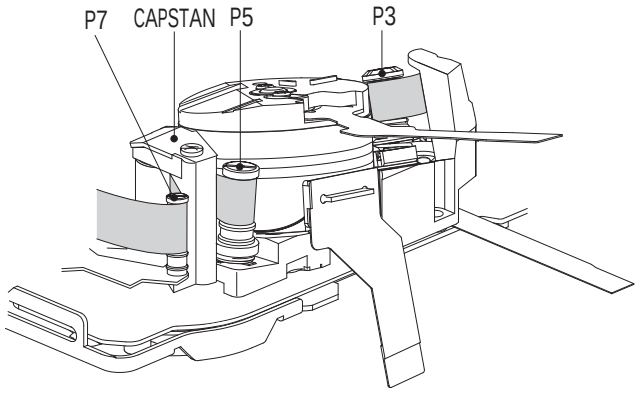


Fig. 5-18

5-4-5(c) P7 Adjustment

❶ Play back the alignment tape, and confirm that the tape is not twisted between the Guide Roller T and Capstan. (If the tape is twisted, turn P7, Fig. 5-19)
❷ Set to REV mode and observe the outlet waveform of PB RF signal. (Fig. 5-20)
❸ If the outlet waveform is out-of-spec, turn P7 counterclockwise, and redo steps 1 and 2.

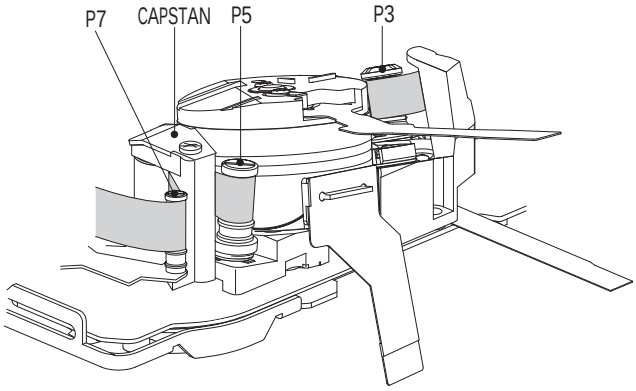


Fig. 5-19

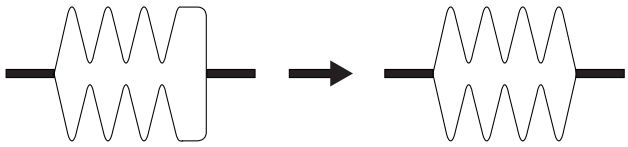


Fig. 5-20

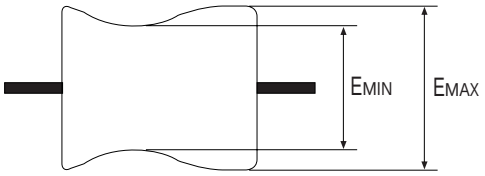
5-4-5(d) Check After Adjustment

1) Tracking Check

❶ Play back the alignment tape.

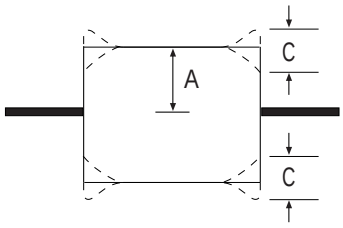
❷ Confirm that the minimum amplitude value(E min.)is 80% of the maximum value(E max.) or larger. (Fig. 5-21)

❸ Confirm that no large fluctuation occur on the waveform. (Fig. 5-22)



$$\frac{E_{MIN}}{E_{MAX}} \geqq 80(\%)$$

Fig. 5-21



$$C \leqq \frac{1}{8} A$$

Fig. 5-22

2) CUE and REV Check

❶ Play back the alignment tape, and set to REV mode.
Confirm that the waveform peaks have a uniform Pitch.(Fig. 5-23 A)
If the track pitch is not uniform, do section 5-4-5(b) (Tracking adjustment) and 5-4-5(c) (P7 adjustment).

❷ Set to CUE mode.
Confirm that the waveform peaks still have a uniform pitch. (Fig. 5-23 B)
If the track pitch is not uniform, do section 5-4-5(b) (Tracking Adjustment).

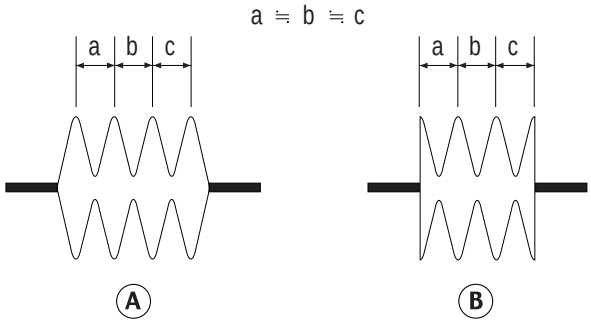


Fig. 5-23

3) Rise Time Check

❶ Play back the alignment tape.

❷ Set to playback mode, and confirm that the waveform of PB RF signal rises flat within 3 seconds. Also confirm that the tape is not twisted or curled around the Pinch Roller. (Fig 5-24)

❸ Run the tape in CUE/REV and FF/REW modes, then playback. Confirm the waveform of PB RF signal rises flat within 3 seconds. Also confirm that the tape is not twisted or curled around the Pinch Roller.

❹ Repeat steps 2. and 3.

4) Tape Path Check

❶ In CUE and REV modes, check that the tape is not curled around the P1, P3, P5 upper flange and P7 upper/Lower flanges.

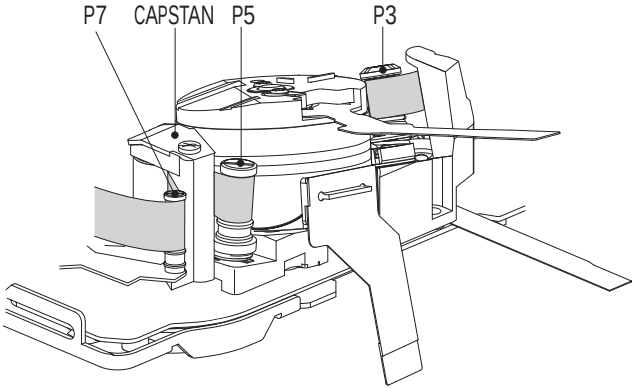


Fig. 5-24

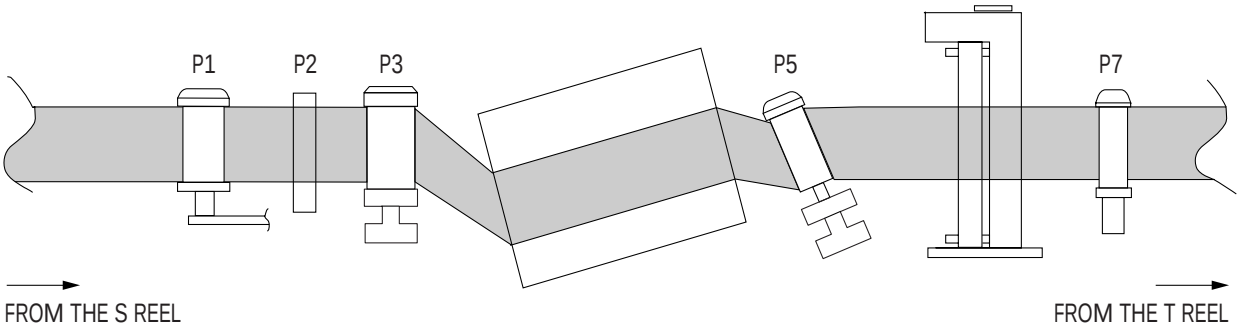


Fig. 5-25

MEMO

6. Circuit Operating Description

6-1 System control & servo

6-1-1 Main function of timer microcomputer

The TIMER MICOM carries out a communication with camera microcomputer for control of each mode transition.
Its main functions are enumerated below.
1) Power ON / OFF control
2) Key function input
3) DV 1chip control / PRML control / Audio control
4) IEEE1394 control
5) Remote controller key input
6) OSD / LCD control
7) Mechanism control

6-1-2 Servo control

Rotation of drum motor and capstan motor of VCR block is controlled by SERVO circuit.
During REC MODE, drum servo controls the rotation phase of drum motor to synchronize video heads to record vertical Sync of video signal at the determined position on the tape.

Capstan servo controls rotation of capstan motor constantly to obtain constant tape speed and to record signal on the tape with the precise PITCH.

During playback mode, drum servo motor is controlled to obtain constant motor rotation and as a result, playback signal with minimum phase variation.
For video head to precisely trace record track and to obtain maximum level of playback signal, capstan servo controls motor.

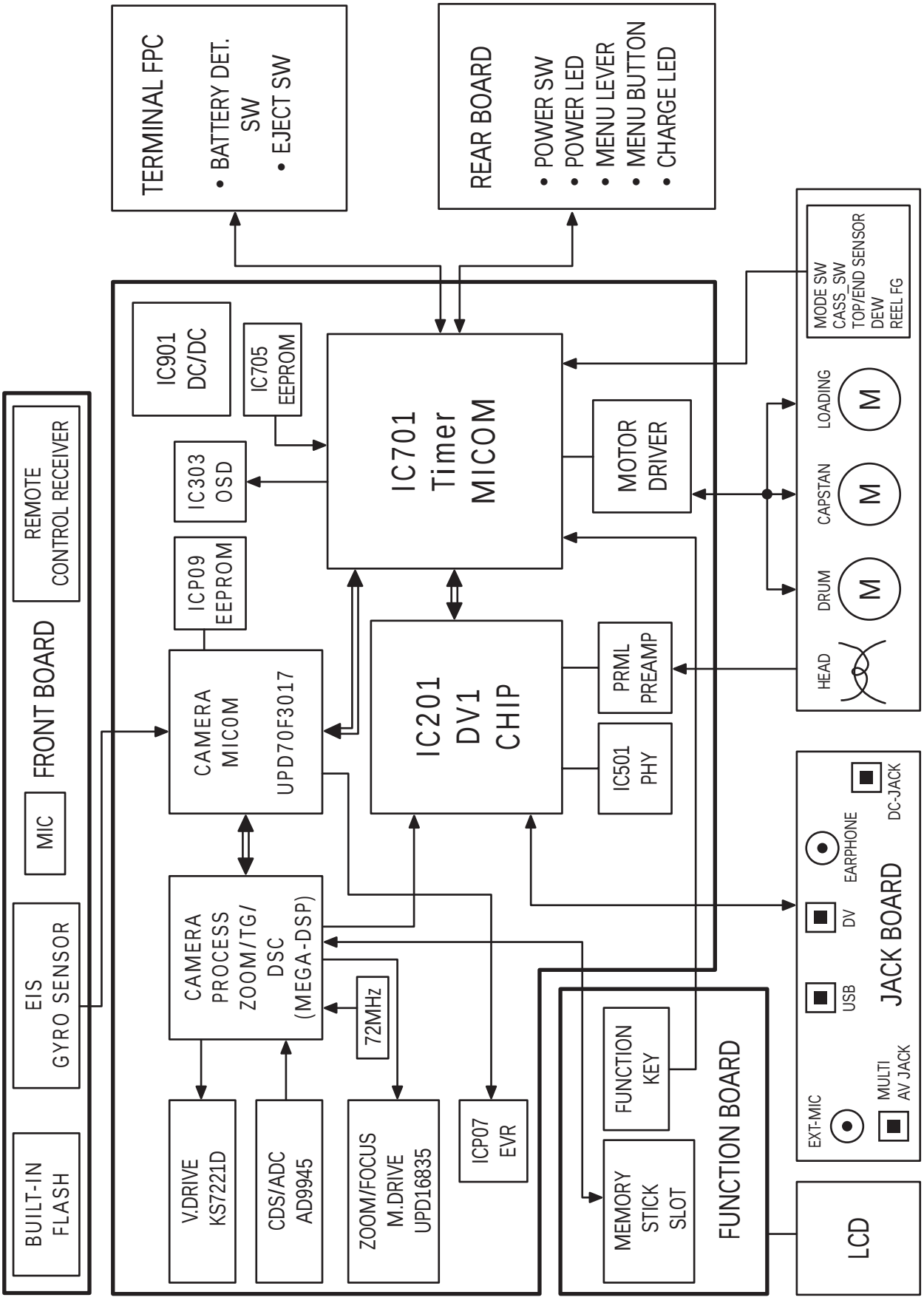

TERMINAL FPC
• BATTERY DET. SW
• EJECT SW
REAR BOARD
• POWER SW
• POWER LED
• MENU LEVER
• MENU BUTTON
• CHARGE LED
REMOTE CONTROL RECEIVER
FRONT BOARD
MIC
EIS GYRO SENSOR
BUILT-IN FLASH
IC901 DC/DC
IC705 EEPROM
IC303 OSD
ICP09 EEPROM
IC701 Timer MICOM
MOTOR DRIVER
CAMERA MICOM UPD70F3017
IC201 DV1 CHIP
PRML PREAMP
IC501 PHY
CAMERA PROCESS ZOOM/TG/ DSC (MEGA-DSP)
72MHz
V.DRIVE KS7221D
CDS/ADC AD9945
ZOOM/FOCUS M.DRIVE UPD16835
ICP07 EVR
FUNCTION KEY
MEMORY STICK SLOT
FUNCTION BOARD
MODE SW
CASS_SW
TOP/END SENSOR
DEW
REEL FG
HEAD
DRUM
CAPSTAN
LOADING
M
EXT-MIC
MULTI AV JACK
USB
DV
EARPHONE
DC-JACK
JACK BOARD
LCD

Fig. 6-1

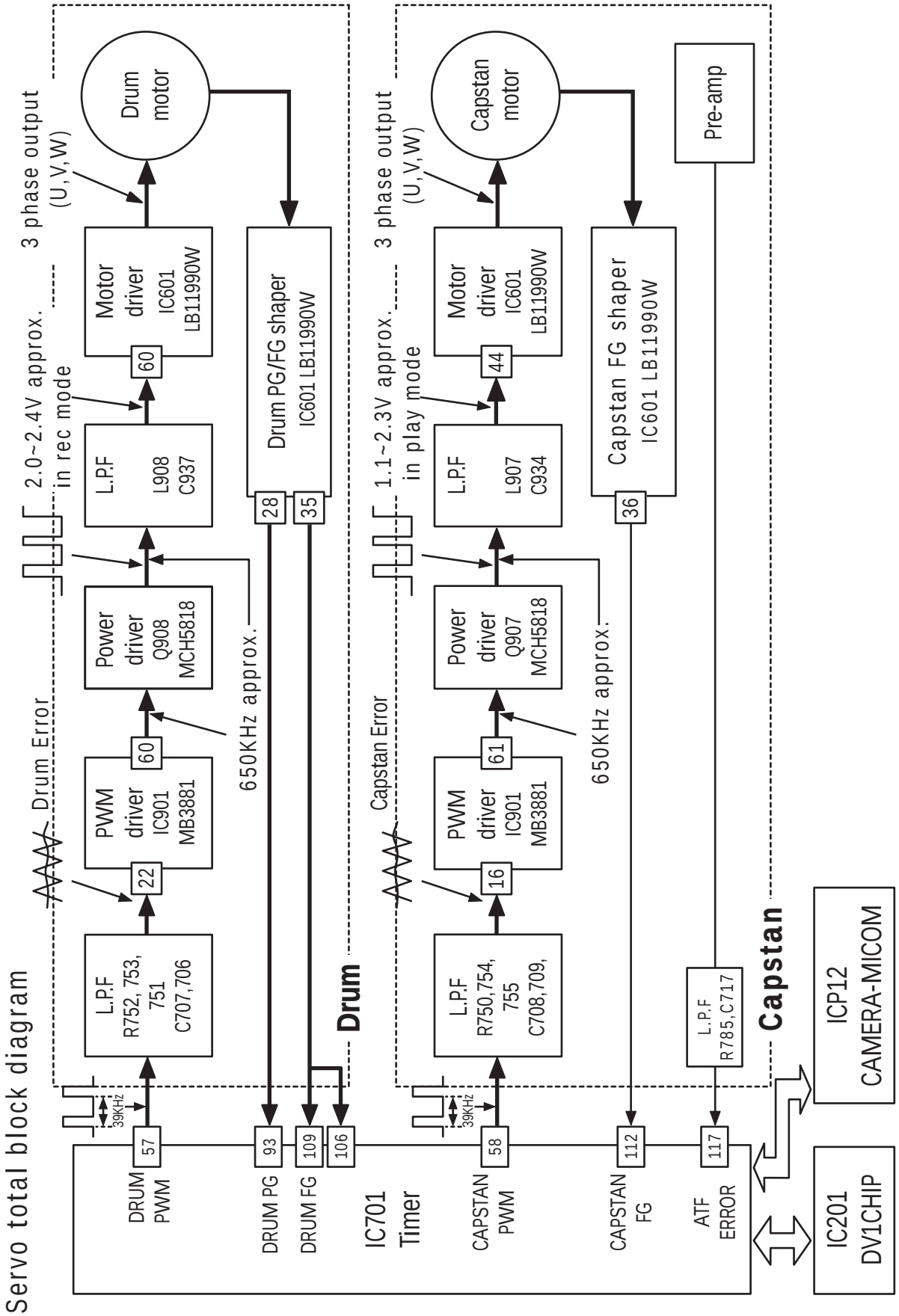

Servo total block diagram
Drum
Capstan
IC701
Timer
Drum motor
Capstan motor
Pre-amp
3 phase output
(U,V,W)
2.0~2.4V approx.
in rec mode
1.1~2.3V approx.
in play mode
Drum Error
Capstan Error
650KHz approx.
650KHz approx.
Motor driver IC601 LB11990W
Drum PG/FG shaper IC601 LB11990W
Capstan FG shaper IC601 LB11990W
L.P.F L908 C937
L.P.F L907 C934
Power driver Q908 MCH5818
Power driver Q907 MCH5818
PWM driver IC901 MB3881
PWM driver IC901 MB3881
L.P.F R752, 753, 751 C707,706
L.P.F R750,754, 755 C708,709,
L.P.F R785,C717
39KHz
39KHz
60
60
22
61
16
44
28
35
36
57
93
109
106
58
112
117
DRUM PWM
DRUM PG
DRUM FG
CAPSTAN PWM
CAPSTAN FG
ATF ERROR
ICP12 CAMERA-MICOM
IC201 DV1CHIP

Fig. 6-2

6-2 Error Check

6-2-1 DRUM-MOTOR ERROR

(1) In case of start up
  1) When the rotation pulse(DFG) has not been input for more then 5seconds since drum motor start up,
  2) When rotation speed is shifted by more then ±25% for 5 seconds, the mechanism is set to READY.

(2) In case of rotation
  1) When rotation speed during nomal operations is not inside of ±30% for 0.5 seconds,the mechanism is set to READY.

  : When drum-motor error is detected, Keys other than POWER and EJECT will not work.

6-2-2 CAPSTAN-MOTOR ERROR

(1) In case of start up
  1) When the capstan motor rotation pulse(CFG) is not inside of 80% for 2seconds compare to the regular quantity on the rotation.

(2) In case of rotation
  1) When the capstan motor rotation pulse(CFG) is under 100Hz for 0.5 seconds,the mechanism is set to READY.

6-2-3 LOADING-MOTOR ERROR

- There is no mode-switch's status varition within 5 seconds, after the loading motor turned on.

6-2-4 REEL ERROR

(1) In case of start up
  1) When the reel rotation pulse has not been input for more then 0.7 seconds since FF/REW stsrt up,
  2) When the reel rotation pulse has not been input for more then 0.4 seconds since mechanism unloadimg stsrt up, the mechanism is set to READY.

(2) In case of the tape running modes
  1) There is no reel FG variation of "H" ÷ "L" in the winding side for 5.4sec/running-speed.

6-3 Explanation of DC/DC BLOCK

DC / DC converter controls a step up / step down type of 8 channel, which is 5V drive(CH4), 3V drive(CH1), 2.5V drive(CH3), 1.8V drive(CH2), LCD Backlight 4V(CH7), drum, capstan motor drive(CH5,6) and 12V, -7.5V drive (CH8).
Channels are turned on and off depending on the voltage levels at the CTL-1 terminal(pin28), CTL-2 terminal(pin29), CTL-3 terminal(pin30), and CTL-4 terminal(pin 31).
The signal connected CTL-1~3 is VCR_DD_ON Signal and CTL-4 is LCD_ON coming from VCR Micom. (refer to Table1, 2)

<Table 6-1 Channel on/off setting conditions>

<table>
<tr><th colspan="4">CTL PIN</th><th colspan="5">Channel on/off</th></tr>
<tr><td>CTL-1</td><td>CTL-2</td><td>CTL-3</td><td>CTL-4</td><td>power</td><td>CH1,3,4,8</td><td>CH2</td><td>CH5,6</td><td>CH7</td></tr>
<tr><td>L</td><td>x</td><td>x</td><td>x</td><td colspan="5">OFF(Standby state)</td></tr>
<tr><td rowspan="8">H</td><td rowspan="4">L</td><td rowspan="2">L</td><td>L</td><td rowspan="8">ON</td><td rowspan="4">OFF</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td rowspan="2">H</td><td>L</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td rowspan="4">H</td><td rowspan="2">L</td><td>L</td><td rowspan="4">ON</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td rowspan="2">H</td><td>L</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
</table>

x :Undefined

<Table 6-2 MODE TABLE>

<table>
<tr><th colspan="2">MODE</th><th>VCR DD ON</th><th>CAM DD ON</th><th>LCD ON</th></tr>
<tr><td colspan="2">POWER OFF MODE</td><td colspan="3">L</td></tr>
<tr><td rowspan="2">PLAYER MODE</td><td>LCD OPEN</td><td rowspan="2">H</td><td rowspan="2">L</td><td>H</td></tr>
<tr><td>LCD CLOSE</td><td>L</td></tr>
<tr><td rowspan="2">CAM MODE</td><td>LCD OPEN</td><td rowspan="2">H</td><td rowspan="2">H</td><td>H</td></tr>
<tr><td>LCD CLOSE</td><td>L</td></tr>
</table>

6-3-1 5V DRIVE

5V drive is controlled by Ch4 of PWM IC.
When CTL-1(28pin) is "H" and Vref(24pin) is "H"(2.5V), CH1,3,4,8 is operated.
PWM switching signal is out from OUT_4(57pin) and allowed to the gate terminal of Q915.
As source termianl of Q915 is always supplied with unreg voltage, Q915 is operated.
PWM output signal of drain terminal become DC 5V through coil(L922), condensor(C961, C962).

Each block of Camcorder that need 5V is supplied with this power.
To feed back DC5V to PWM IC, R923 and R924 are used as voltage divider.
As Divided voltage feed back and is compared with Vref(2.5V), dc 5V become constant by varing duty of OUT-4 switching signal.
Another 3V, 2.5V, 1.8V, Backlight 4V drive is also operated with similar way like 5V drive.
Also Transitor like Q916, Q917 is switch TR. Mode signal of base terminal supplies power to the block using switching TR
(ex:"CAM DD ON" ==>> CAMERA MODE)

6-3-2 DRUM, CAPSTAN MOTOR DRIVE

Drum, capstan motor drive is operated by CH5,6. When CTL-3(30pin) is "H" and cap.error, drum.error signal from micom is allowed to 16, 22 pin of PWM IC, CH5, 6 make PWM signal. When you perform PLAY, FF, REW, REC function etc, error signal is coming from micom(servo). PWM output waveform of OUT-5, 6 port is controlled by this error signal.
Next operation is similar with 5V drive explained above.

6-3-3 12V, -7.5V DRIVE

12V, -7.5V drive is operated by CH8 of PWM IC. CH8 is step up channel.
When output signal of PWM IC is allowed to base terminal of Q901, rectangular wave of Vpp 12V is occurred at the collector from coil(L903)
This rectangular wave is rectified through diode built on Q901 and rectified power is supply to each block that need that power.
Next operation is similar with 5V drive explained above.

6-4 Explanation of AUDIO Block

6-4-1 REC(CAMERA) MODE

Input signal of audio is coming to input port(internal : 40, 45 pin, external : 39, 46 pin) of audio IC(IC841) through MIC(Internal MIC & External Mic) cell.
Input signal go through amplifier built in IC and go output to 18, 19 pin of IC and then send to AV Jack.
If the mode is rec, amplified audio signal go output port of audio IC and simultaneously in the IC internal logic, analog signal is convert to digital to send digital signal to 14pin port of audio IC.
This digital signal go into DV 1chip and is written on tape through compression processing.

6-4-2 PB MODE

PB is reverse order of rec processing.
DV1 chip deshuffle compression data written on tape and send digital data to 13pin port of audio IC(IC841).
IC841 convert this digital data to analog signal to go out 18, 19 pin(audio output port) of IC841

6-4-3 SPEAKER

A/V JACK DETECT signal control speaker operation
When A/V jack is inserted to the set, speaker dosen't work Only when A/V jack is not connected to the set and LCD is opened, speaker work.

6-4-4 BEEP SOUND

Signal coming from voice IC(IC843 4pin) go into 25 pin of audio IC and then Beep sound opreates.
Sound of voice IC is fixed. Micom select the fixed sound through communication with voice IC when mode is changed or you push function button. Beep sound dosen't operate in the process of PB or REC

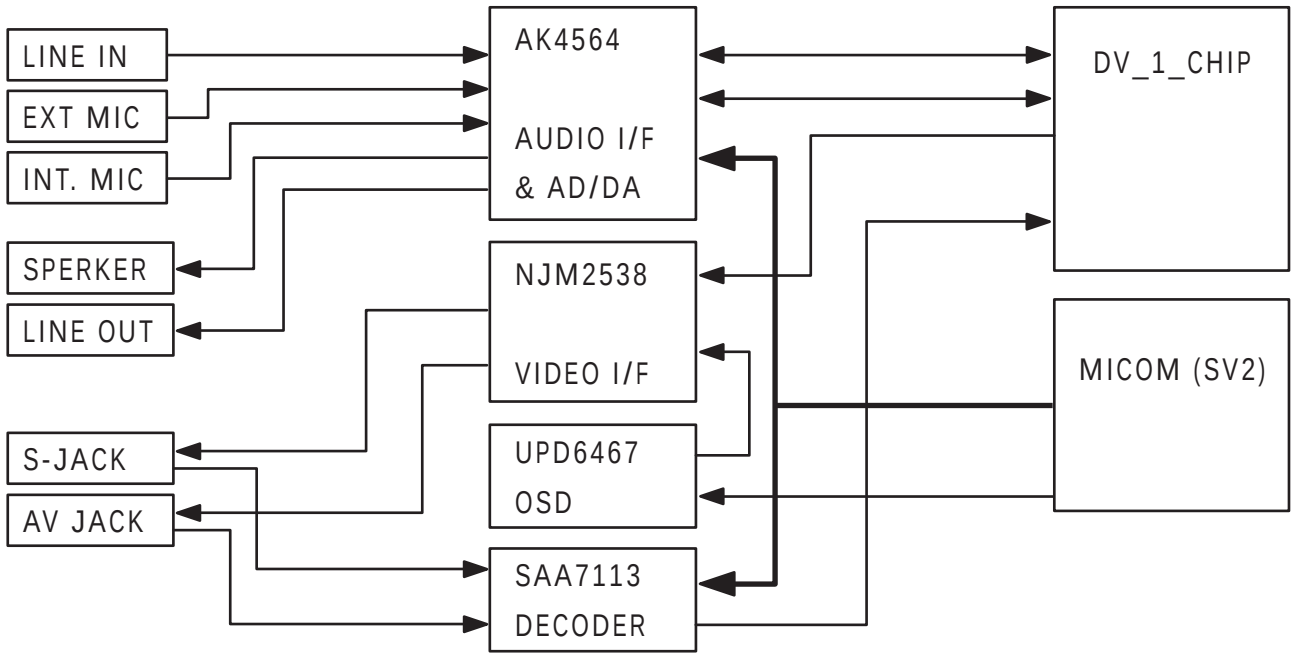


Fig. 6-3 AUDIO INTERFACE BLOCK

Audio I/F block performs in/out interface function of 16bits AD/DA.
When coming key input, beep sound signal go to speaker.

6-5 CAMERA BLOCK

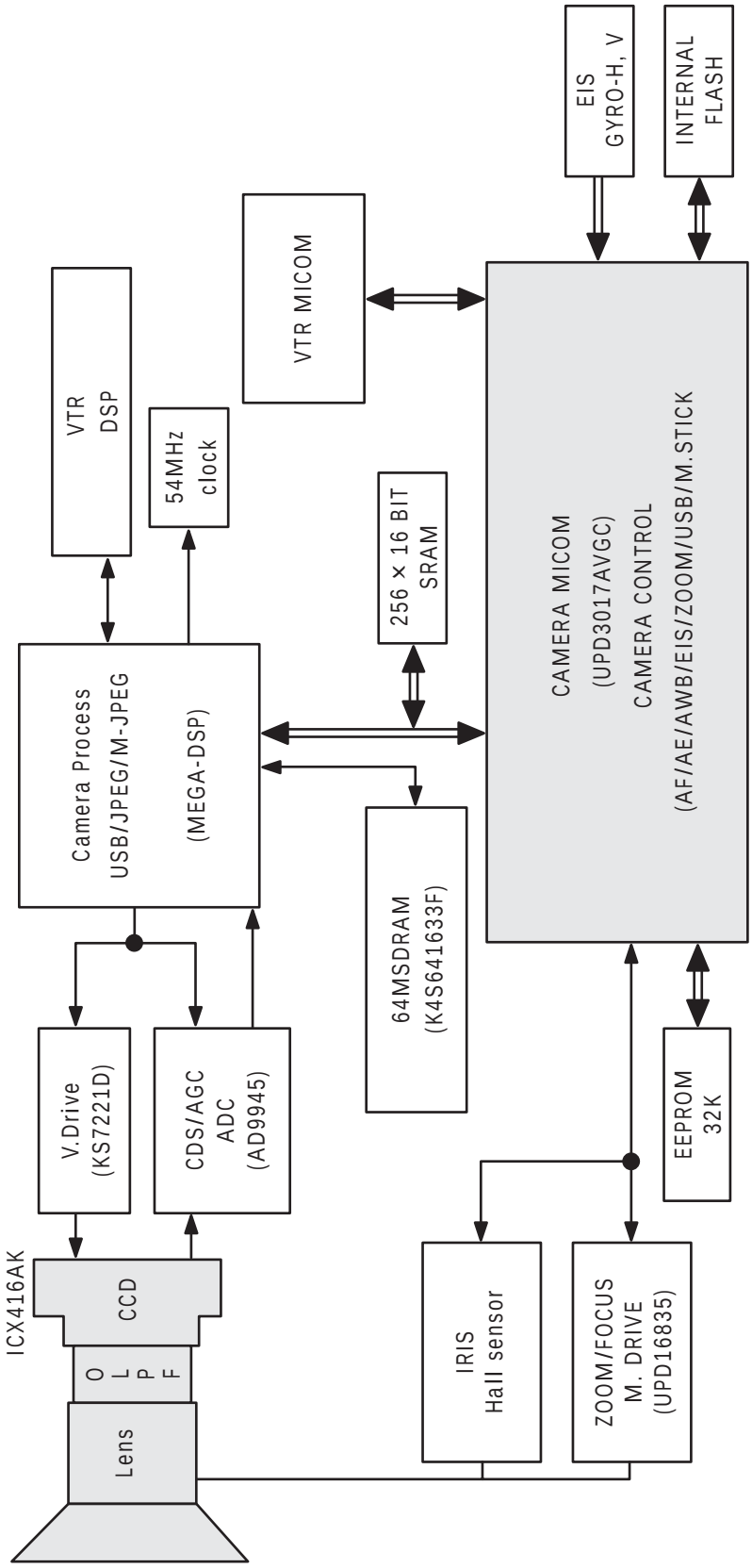


Fig. 6-4 CAMERA BLOCK

6-5-1 CAMERA MICOM Initially operation

(1) Practice(Output Of Blue Screen) VCR MUTE and Control power as bing Micom recognizes action mode when the power is on in the SET.
- POWER is ON in the CAMERA MODE

<Table 6-3>

POWER/MODE	CAMERA	OFF	VTR	
CAM5V	O	X	X	ICP02,ICP04,ICP05,ICP06(IRIS,HALL BLCOK), STROBO BLOCK
CAM3V	O	X	X	ICP03(CDS/AD), ICP08(MOTOR DRIVE),EIS BLOCK
DSP3.3V	O	X	O	ICP11(DSP),ICP12(CAMERA MICOM),ICP10,ICP13,ICP09
DSP 2.5V	O	X	O	ICP11(DSP)
CCD 15V	O	X	O	ICP01 (CCD V_DRIVE)
CCD -7.5V	O	X	O	ICP01(CCD V_DRIVE)

(2) When the power is ON in the MICOM, it starts a oscillation of 20MHZ , the RESET signal which comes from VTR MICOM it waits.

(3) It reads the DATA which in the EEPROM (ICP09) is stored in relation IC DATA transmission (CDS_AD / DSP) by means of SERIAL communication / or PARARELL communication.

(4) It accomplishes an initially anger operation relation of CAMERA
- CCD KIZU compensation : It controls SLOW SHUTTER from the condition which closes the iris of the LENS and the KIZU (WHITE DEFECT) of the CCD it detects and and it compensates.
- ZOOM / FOCUS OF LENS RESET CHECK:
  It moves the ZOOM and FOCUS motor and it searches for an the mechanical structure RESET location. Location of the ZOOM LENS it moves with a BACK-UP location (Previously condition of power off)from RESET location
  › When the problem occurs in the RESET CHECK(10 second or more), the screen light lately, when the ZOOM operates, the focus is not right.
- AE initially operation :
  It is a place where the use condition of present time dawns it is a dark place and the possibility of knowing not to be with regual data the iris after opening in order to arrive to AE set point, it controls the IRIS.
- AWB initially operation:
  In order for and to receive color temperature,brightness of screen and the location of ZOOM of present time after controlling at regual data, the WB MAIN ROUTINE to be executed.

(5) When the operation is completed, it delivers a completion signal in the VTR MICOM and the VTR MUTE(BLUE SCREEN) is released and the screen is output.

6-5-2 CCD and High-speed transmission signal DELAY ADJUST

The CCD uses the ICX416AK of the SONY.
Total number of pixels is 1.33M pixels. 1/4INCH .It is applied with commonness NTSC/PAL.It has compansational area of trembling hand of 33%.

<Table 6-4>

Structure	Number of pixels	Horizental(H)	Vertical(V)
Total Number of pixels	1,330,000	1363	975
Number of effective pixels	1,250,000	1290	966
actual effective pixels(DSC)	1,230,000	1280	960
record pixels 4:3 NTSC/PAL	690,000	960	720

When actual effective pixels possibility photographing the picture, becomes the maximum SIZE. Therfore the maximum SIZE of the picture which it provides from this model becomes the 1280(H)X960(V) pixels.
The pixel which other than 4:3 screens(690,000 pixels) which it uses from the camera tape record mode remains becomes the compansational area of trembling hand.
The horizontality transmission becomes the drive with the 36MHz clock.
It is planned with the structure where the DELAY ADJUST of the ccd horizental driveing pulse and high speed pulse is possible.
The signal where the Delay Adjust is possible like is appearing in above the picture is H1, H2, RG, SHP, SHD and ADCK signal.
SHD,SHP,RG signal is possible to adjust Delay of 1ns per 1step of data.
And H1,H2 signal is possible to adjust the width and phase of pulse of 1ns per 1step of data.
The TIMING set of the SAMPLING pulse of the CDS/AGC/AD IC and CCD driving is very important.
And that to form or degree of the noise an effect it gives it is necessary a lot, it sets the separate TIMING from the MODE which is judged.
Vertical transmission from DSC mode is not possible to read a whole pixel in 1 FIELD.
Therefore it reads a whole pixel in 2 field.
Becomes the maximum 15 frame per second. So the DSC mode becomes the reason where the screen is not continued.

6-5-3 PREPROCESS MODULE

The following objects are available in the Preprocessing Module

- ADC delay compensation
- Digital Clamp
- White Fault Detecting
- Fault Sorting
- Fault compensation

6-5-4 Luminence Signal process Module

We perform the following abilities because of making the luminence signal which are made by outputs (s1, s2) of CCD.

- Color Suppression (Highlight, Edge Suppress)
- Horizontal Aperture
- Vertical Aperture
- After controling aperture Non-linear characteristic process
- Noise Slice
- Level Clip
- Gamma Compensation
- Detail Enhancement
- High-Light Aperture Control
- Gain Control of Luminence signal
- Art Freeze
- Posi / Nega Effect of image

6-5-5 COLOR SIGNAL PROCESSING

Using output of the CCD,the processing creates color difference signal (R-Y, B-Y) for the output of composite color signal and so delivers with the scale module. And it generate the signal for the white adjustment and so delivers with OPTICAL DETECTION MODULE.

- The color signal separation which uses the LPF and LPF function.
- R,G,B generation function
- white and black adjustment function
- Gamma Compensation function
- function of Color difference signal generation
- Control ofHue compensation and color difference signal gain
- Color suppression function of high luminance / boundary
- Posi / Nega function
- Color Key function
- Blue Effect function

6-5-6 Digital Scale

Against the luminance and color signal,with independent digital zoom process of a horizontal and vertical direction the process materializes digital scale image of high power added to optical scale.

- 256 Step Digital Scale due to Cardinal Spline Algorithm
- A vertical expansion of image due to control of CCD Vertical Drive
- Execution of a horizontal expansion and horizontal,vertical interporation due to built-in 2H DELAY LINE control
- 4:2:2 Source Format
- The function of independent scale power application for a horizontal,vertical direction
- Compensation for unintentional hand of a horizontal direction and sub-pixel of vertical direction
- 64 Step Mosaic function
- Half/Full Mirror function

6-5-7 OPTICAL DETECTOR

It receives luminance signal and a color signal from the Luminance Block and Chroma Block and so express the data included Auto Focus(AF), Auto Exposure(AE), Auto White Balance(AWB) from inside the Window area through MICOM .And it make window pulse because of displaying each window area (AF, AE,AWB).

- Integral calculus function of 1 Field luminance signal from inside the Window1 area for the AF .
- Integral calculus function of luminance peak by line from inside the Window1 area for the AF .
- Function of luminance level clip count from inside the Window1 area for the AF .
- Integral calculus function of 1 Field luminance signal from inside the Window2 area for the AF .
- Integral calculus function of luminance peak by line from inside the Window2 area for the AF .
- Integral calculus function of 1 Field luminance signal from inside the Window1 area for the AE .
- Integral calculus function of 1 Field luminance signal from inside the Window2 area for the AE .
- Function of luminance level clip count from inside the Window1 area for the AE .
- Integral calculus function of 1 Field R,G,B signal from inside the Window area for the AWB .

6-5-8 Sdram controller

Following to each operation, it allocates a MEMORY area each and it uses. It is composed to be possible for the high-speed transmission.

- Corresponding to 16bit, 4bank SDRAM
- Connection of MJPEG Controller
- DMA tranmission function
- INITIALIZE fuction
- Function of SCALE conversion
- Function of OSD indication
- Function of LINE indication

6-5-9 Jpeg controller

It composes JPEG to be possible for the high-speed control with the HARDWARE. And it applies the table which corresponds with it by the set of the REGISTER .

- Compression and extension are based upon ISO/IEC10918-1 JPEG STANDARD BASELINENPROCESS.
- Compression and extension FORMAT : corresponding to 4:1:1, 4:2:2
- MAKER automatic addition and interpretation function
- TABLE
  Quantization table : Three types of color component
  HOFMAN TABLE : Four types of DC and AC component against component of two types

6-5-10 PLL controller

It provides the 54MHz to the VTR blcok.

- Converting 54 MHz to 36MHz
- external clock mode

6-5-11 USB 1.1 controller

It transmits the data in ISO transmission method of the USB.

- USB 1.1 standard (12Mbps)
- ISO transmission method

6-5-12 DMA controller

It transmits the data in ISO transmission method of the USB.

- CANNEL number : 4 CANNEL
- ADDRESS space : 8M BYTE
- Bit of transmission DATA : 8BIT, 16BIT
- The maximum transmission frequency : 524288 times

6-5-13 Memory Stick Controller

The inside of memory stick is composed of the flash memory and controller.
A Function of controller is control of the plural flash memory , absorption of quality difference of various flash memory,the error amendment which responds in various flash memory error quality and conversion of parallel and serial data.

- 8 bytes (4 wards) FIFO is composed of buffer for each transmit and receive.
- It is composed of CRC circuit.
- Until 80 Mhz it delivers (when using SONY C5MX-HB-T the library which is an external input)
- DMA support
- When INT is compensated from M/stick execution of automatic command execution can put out or turn on.
- MagicGate support
- All registers (for SCAN) is embodied with positive edge F/F.
- The protocol from CPU is started with the fact that it writes in the command registers.
- The Data by the DMA or when the data period comes in, by the interrupt of the CPU becomes the request .
- The RDY timeout period comes to become the set by a serial clock number.
- When also the timeout happens,The Interrupt is a possibility becoming the output for the CPU.
- It is composed of 4 bit parallel port.
- It acesses by 16 bits .
- The output form FIFO is little endian.
- At the time of power save mode one the Pws_clk is fixed with Low level.

6-6 CAMERA ADJUSTMENT

6-6-1 ADJUSTMENT METHOD IN SET(SC-D93)

For ITEM adjustment:

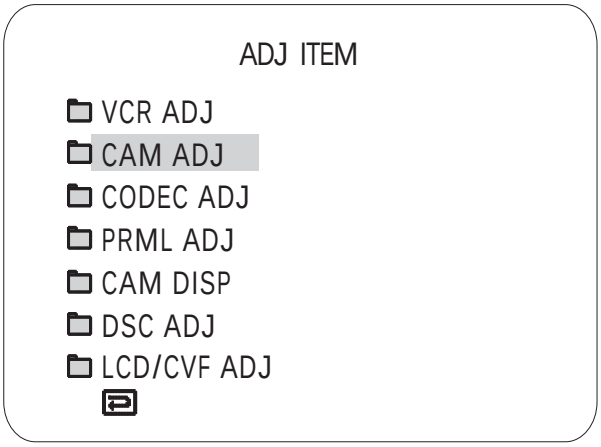
- We can start Control ITEM Menu when we push MEMORY MIX KEY and BLC(STOP) KEY in 3 second during STOP.

Select adjust ITEM:

- Find the ITEM moving the VOL/MF DIAL up and down.

Start adjust mode:

- 360We can start Control Mode which we select when we push the VOL/MF Enter KEY.



<Table 6-5>

FUNCTION OF EACH BUTTON IN ADJUSTMENT MODE		
CONTENT	SET KEY	NOTE
ADDR UP	EASY KEY	
ADDR DOWN	DISP KEY	
DATA UP	VOL/MF UP KEY	
DATA DOWN	VOL/MF DOWN KEY	
CONFIRM	VOL/MF ENTER	Push the dial key
DATA SKIP	MENU KEY	Add 16 to DATA
NEAR	MF/AF DIAL	Only SET CAM adjustment
FAR	MF/AF DIAL	Only SET CAM adjustment

6-6-2 OMEGA- PJ DVC CAMERA ADJUSTMENT

(1) The adjustment method in SET

* IN CAMERA MODE

PUSH THE MEMORY MIX KEY + BLC(STOP) KEY in 3second.

› DISPLAY MENU OSD

- VCR ADJUST (CANNOT ADJUSTMENT)
- CAMERA ADJUST
- CODEC ADJUST
- PRML ADJUST
- CAMERA DISPLAY
- DSC ADJUST (CANNOT ADJUSTMENT)
- LCD / CVF ADJUST

* FUNCTION OF EACH BUTTON

1) CONFIRM ; ENTER(VOL / MF DIAL)
2) ADDRESS UP / DOWN ; EASY / DISPLAY
3) DATA UP / DOWN ; VOL / MF DIAL
4) DATA SKIP (Add 16 to DATA) ; MENU KEY
5) NEAR / FAR ; MF DIAL

6-6-3 FLOW CHART

<Table 6-6>

	CONTENT	ADJUSTMENT METHOD	SPEC	NOTE
0	INITIAL ADJUSTMENT	① CONFIRM DATA "AA"TO ADDRESS "0DF"	WHEN CHANGING ONLY EEPROM , ACCOMOLISHMENT	
1	HALL ADJUSTMENT	① CONFIRM TO ADDRESS "0CD"		
2	IRIS ADJUSTMENT	① CONFIRM TO ADDRESS "0CE" (AFTER HALL ADJUSTMENT ADJUST IRIS)		
3	AWB ADJUSTMENT (INDOOR ADJUSTEMT)	① ADJUSTMENT CONDITION : ADJUST 3100°K GRAY SCALE CHART WITH THE 40µs ② CONFIRM TO ADR."0D4"(3100°K ADJUSTMENT)		
4	AWB ADJUSTMENT (OUTDOOR ADJUSTMENT)	① ADJUSTMENT CONDITION : ADJUST 3100°K GRAY SCALE CHART WITH THE 40ß¡ ② CHANGE ADDR. "0D5" (5100°ΔK ADJUSTMENT) ③ CONFIRM TO BE LOCATED "C16" FILTER ON THE FRONT LENS		
5	LENS ADJUSTMENT	① ADJUSTMENT CONDITION:JUST ADJUST COLLIMETER ② CONFIRM TO ADDRESS "0D0"		
6	ZOOM VR ADJUSTMENT	① CONFIRM TO ADDRESS "0D6"		
7	3M LENS ADJUSTMENT (HAS NOT COLLIMETER)	① ADJUSTMENT CONDITION : ADJUST TO BE LOCATED FOCUS CHART WITH THE 3M ② CONFIRM TO ADDRESS "0DE"		

6-7 The VIDEO section operation explanation

6-7-1 BLOCK diagram explanation

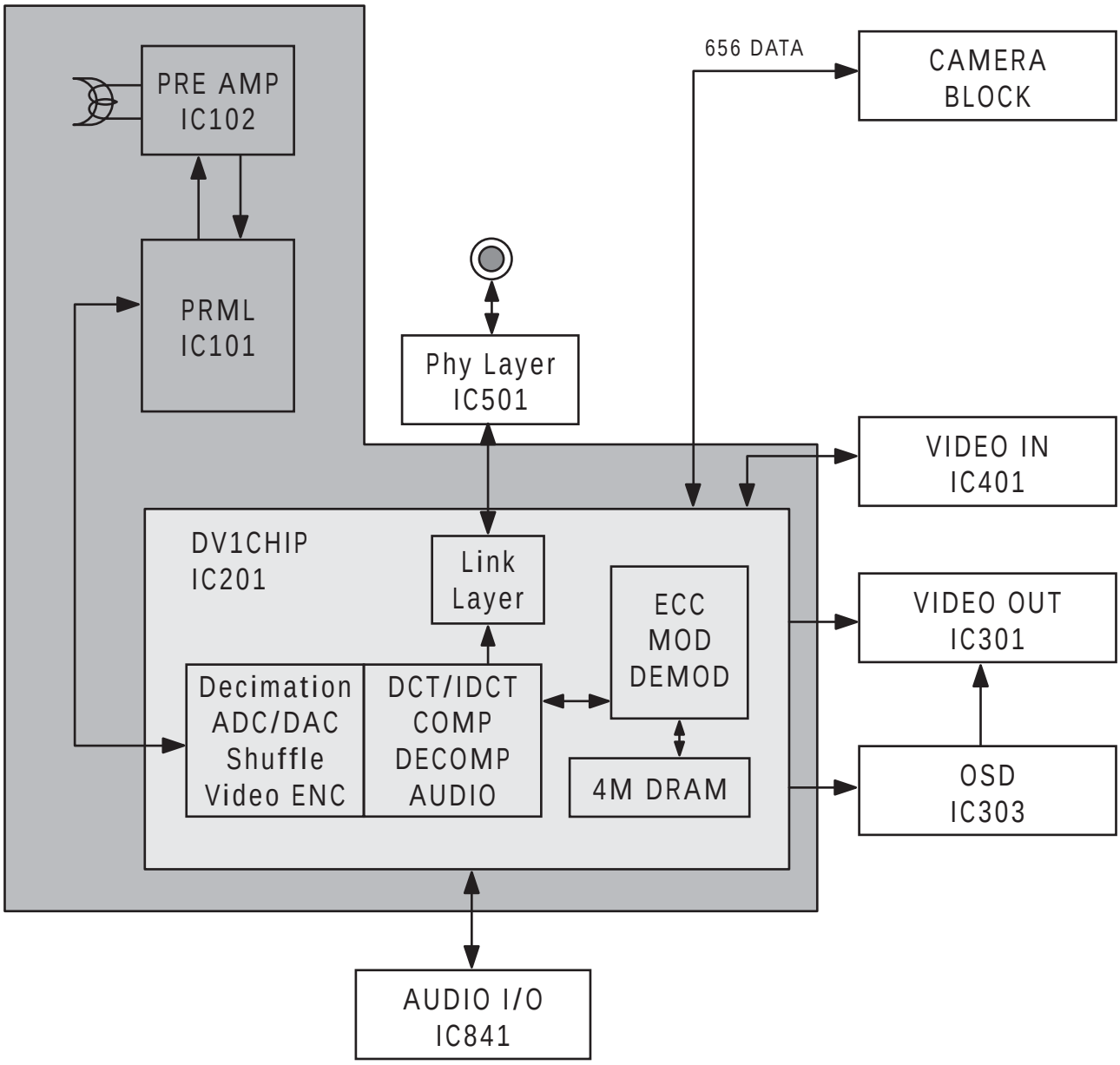


Fig. 6-5 video BLOCk composition

VIDEO composition of BLOCK

(1) PREAMP BLOCK : It amplifies the signal which is input from the HEAD

(2) PRML BLOCK : In order to be suitable in image signal control, it controls the PRE AMP output Signal.

(3) SIGNAL PROCESS : Recording and playback image signal process

(4) IN / OUTPUT DRIVE : It outputs a video signal it inputs at outside the circuit for

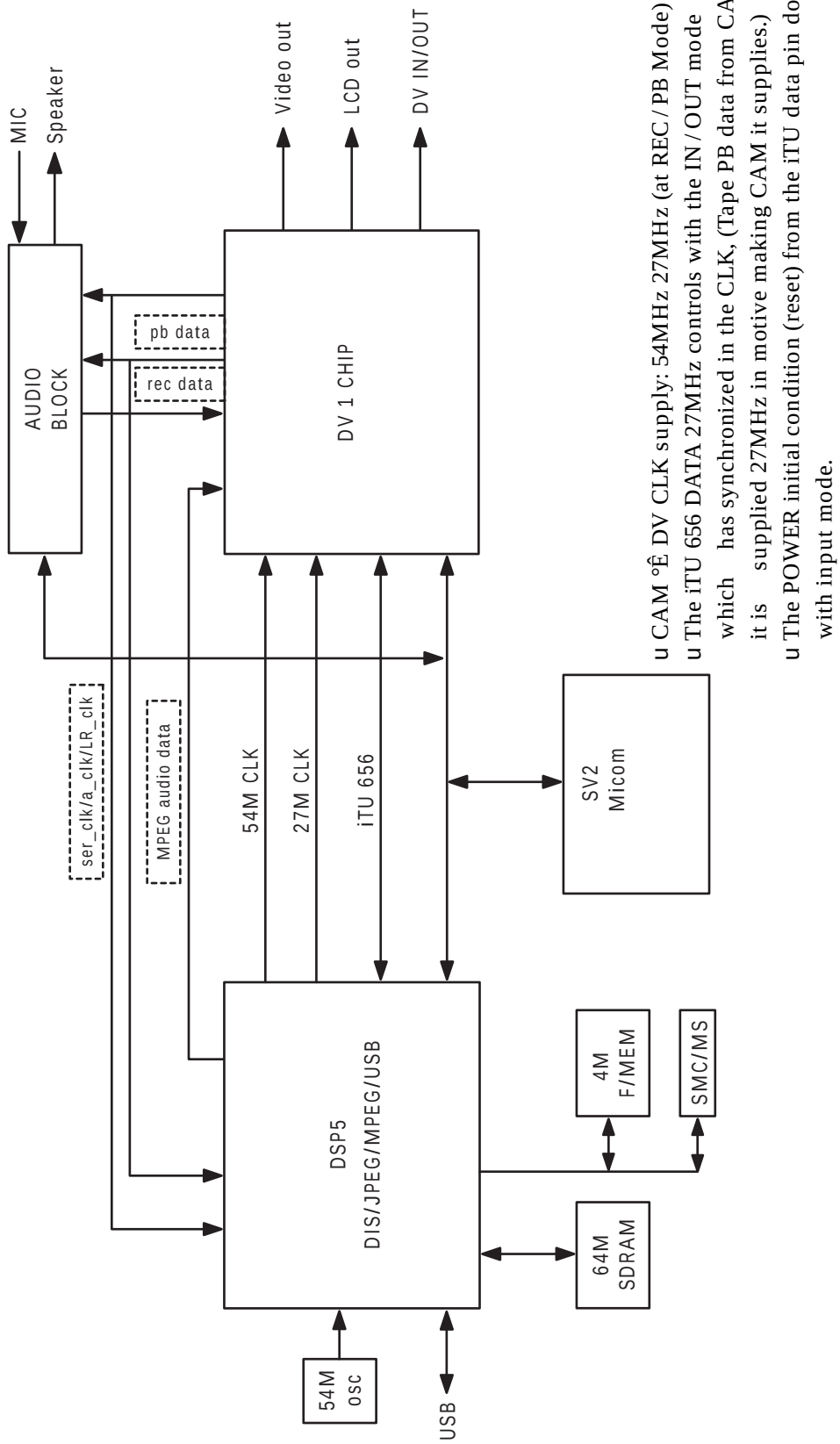
(5) OSD BLOCK : The character occurrence and mix circuit

6-7-2 The operation explanation against the PRML

The PRML, from Micro Processor by the Control Signal of Serial Enable / Data / Clock the each mode (the SP-PB, the LP-PB and SP-Forward / Reverse Search, the LP-Search, the SP-Slow and LP-slow etc) to follow from the BLOCK and data control in order to be done.
Also, the Head S / W Pulse is input and the possibility the signal control becoming accomplished continuously from the High segment and the Low segment of remaking hour input signal (Envelope Output) in order to be, the Control it becomes.
The DV-1chip (Channel Block) from with Power Down, the PB-High and Adaptive High to receive a same control signal and to Recording Time period to stop (Power Down), to Playback Time period the possibility signal control of operating normally in order to be, an operation and and must come to become the control.
With the DV-1chip (Channel Block) 41.85MHz it makes Playback Clock and Playback Data and it supplies with there must be it will be able to execute a Playback operation.
Also, when from the DV-1chip (Channel Block) 41.85MHz supply to receive a signal, a stable remaking operation the input signal which is unstable from the PREAMP being input to (Search Mode or tape damage etc) to give a signal and with PB Clock paragraph exchange in order to execute. te.
From the PREAMP remaking output signal of Differential input (DIP and DIN) supply receiving AGC, the Dropout and Analog qualizer and Digital Equalizer, 1+D, it accomplishes the Function of the Viterbi back and 41.85Mbps with the DV-1chip (Channel Block) it supplies PB data.
From playback signal the highest cycle prisoner of remaking signal 20.925MHz it executes a X2 process and 41.85MHz with the DV-1chip (Channel Block) it supplies PB clock.
Also, from remaking output signal it executes ATF Signal Processor and F0 / F1(465KHz) / F2(697.5KHz) it makes it supplies with Capstan Control it uses with Micro and Processor ATF coltrol ATF Error signal .
From the DC / DC 3.3Vdc and 1.8Vdc it uses 2 branch all the member with the standard all the member of the block which is necessary to the control of control signal of the supply receiving inside operational all the member and outside and. Also, by outside option (pull up or pull down) the inside 1.8V it will be able to operate the regulator.
This time the external all the member 3.3V the use is possible with the single all the member.

6-7-3 DSP5 & DV 1chip interface

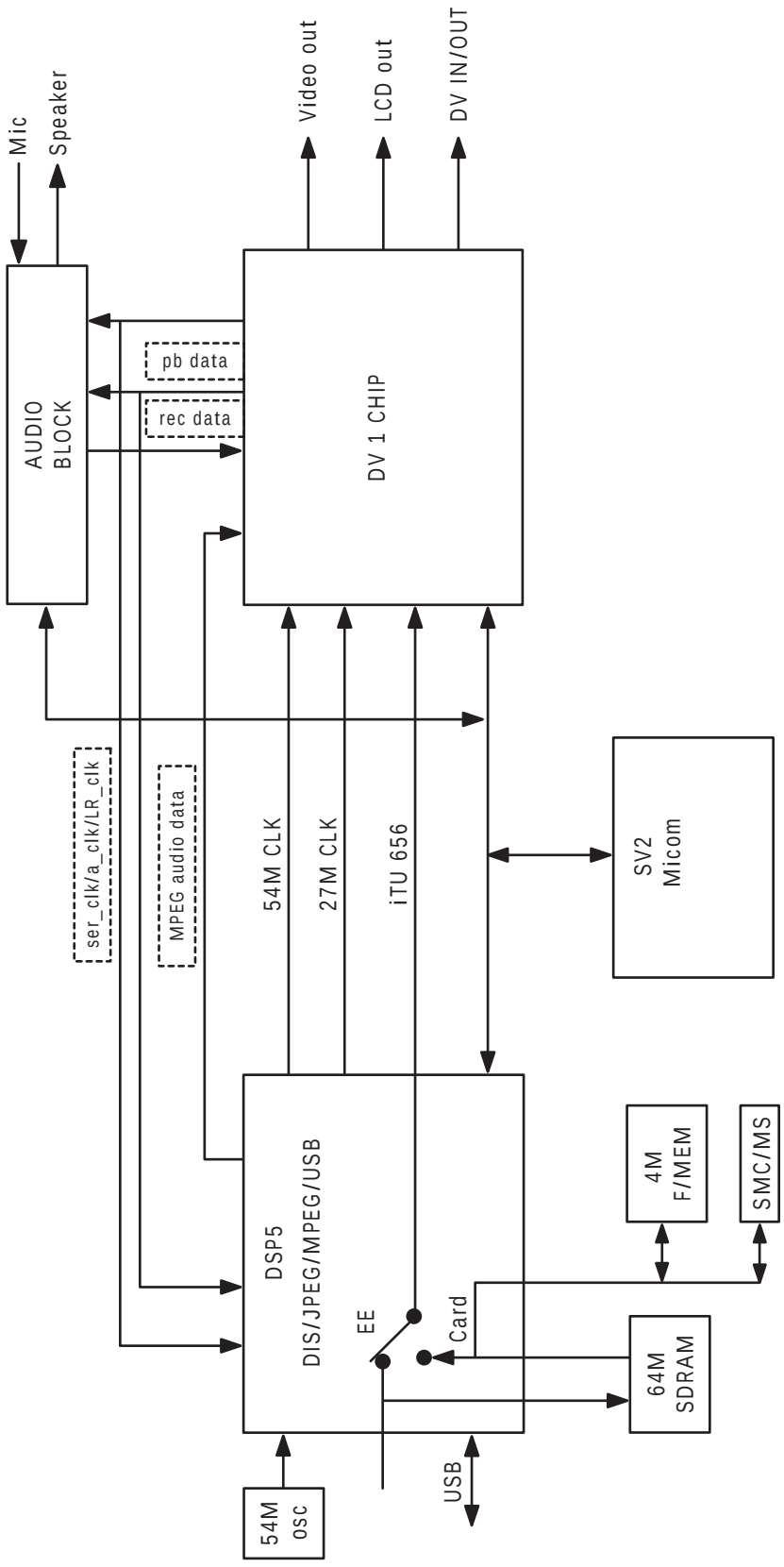
(1) System block diagram



u CAM ºÊ DV CLK supply: 54MHz 27MHz (at REC / PB Mode)
u The iTU 656 DATA 27MHz controls with the IN / OUT mode which has synchronized in the CLK, (Tape PB data from CAM it is supplied 27MHz in motive making CAM it supplies.)
u The POWER initial condition (reset) from the iTU data pin does with input mode.

Fig. 6-6

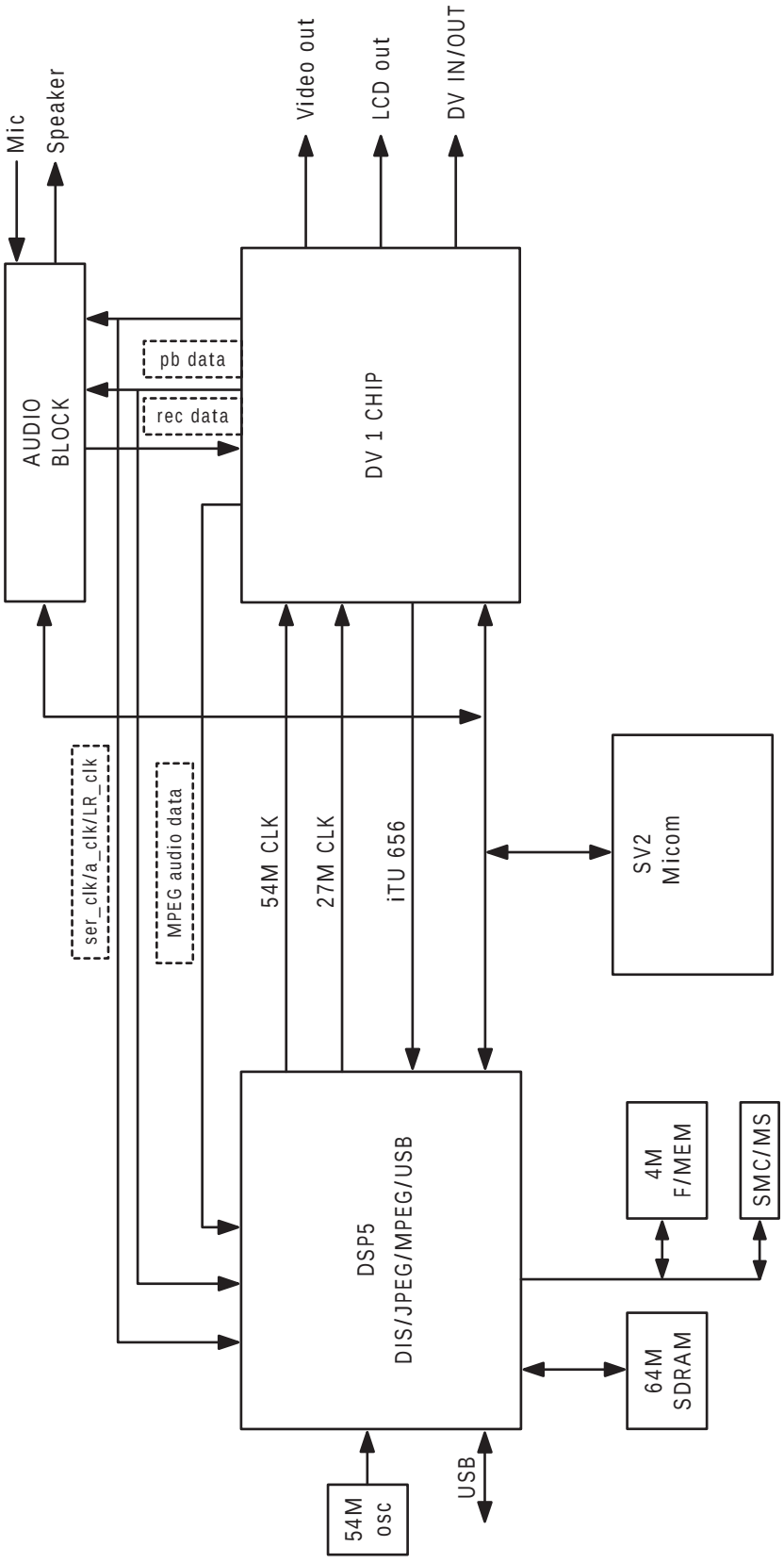
(2) CAM EE & Memory(=Card)Recording mode



- The Memory the Card or camera EE Mode selection controls from the micom.
- It extends before Mode and the DSP5 the DV 1chip 54MHz, 27MHz supplies the clock.

Fig. 6-7

(3) Tape Playback & Memory Recording Mode



- 27MHz The clock the CAM °Ê supplies in the DV and 54MHz it becomes synchronization.
- The Card from recording hour DV chip field and data the capture it supplies in the DSP5. (Mode transient from micom control box)
- Eastern image card recording hour audio data max = 48KHz * 16bit * 60 seconds (60 second card recording hours)
- The Tape remaking audio clock information (48K / 32K) supplies (the Audio data length 48K / 32K public affairs 16bit is from the Micom)
- The Tape the PB data from the dsp5 is output 27MHz supplies in synchronization making dsp5.

Fig. 6-8

(4) Memorystick playback & Tape recording mode

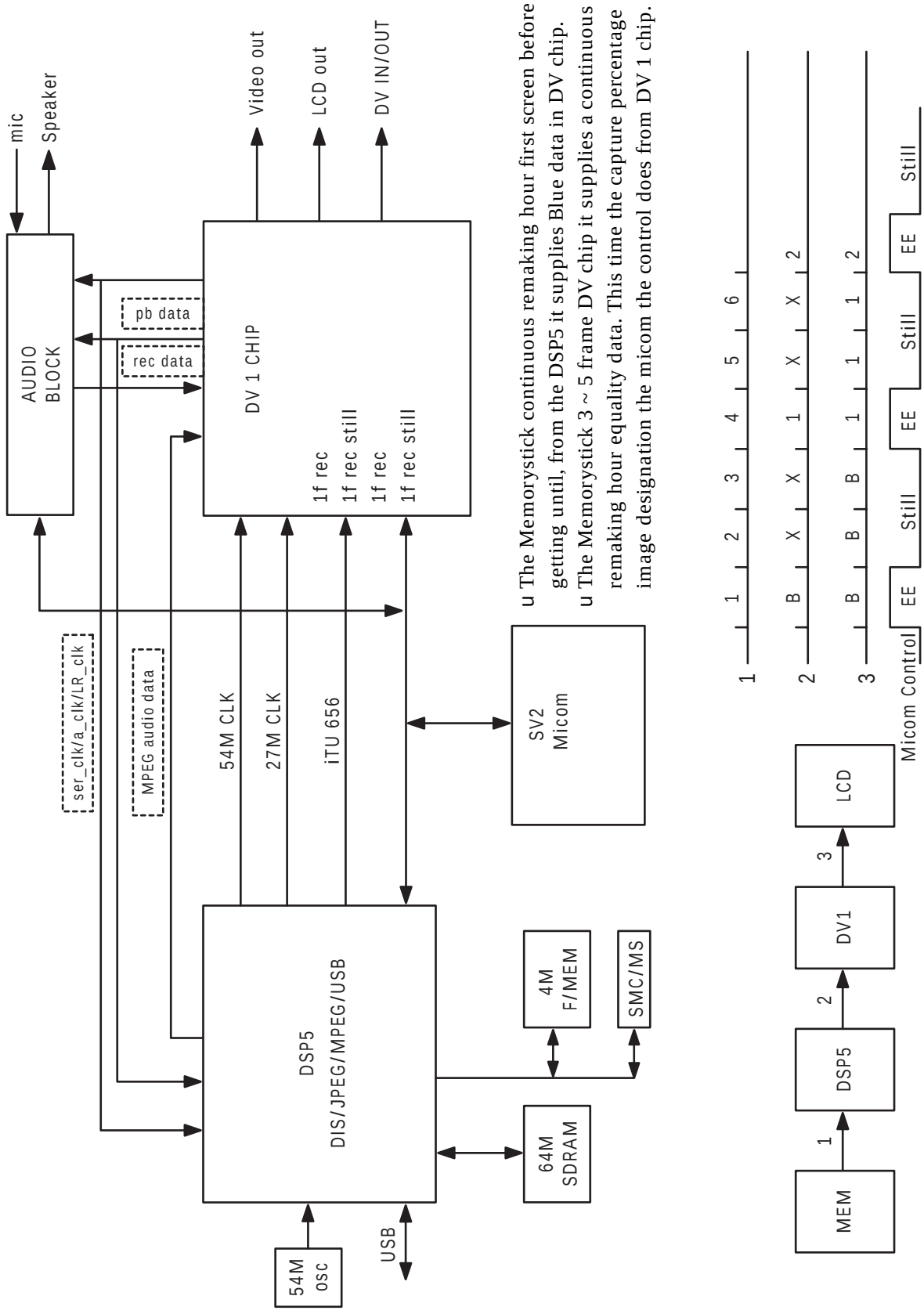


Fig. 6-9

- The Audio the ser_clk / a_clk / LR_clk / PB_data the dsp5 and Audio block own jointly
- The Audio the REC_data MPEG remaking hour dsp5 output and Audio block output the DV 1chip from it uses the MUX and it selects, (this time DV 1chip audio PB_data pin "low" level or hi-Z it controls)
- MPEG for an eastern image Card remaking hour speaker output the DV 1 chip receives Card REC_data and Audio PB _data the bypass it makes with the pin.

6-7-3 O.S.D. CIRCUIT

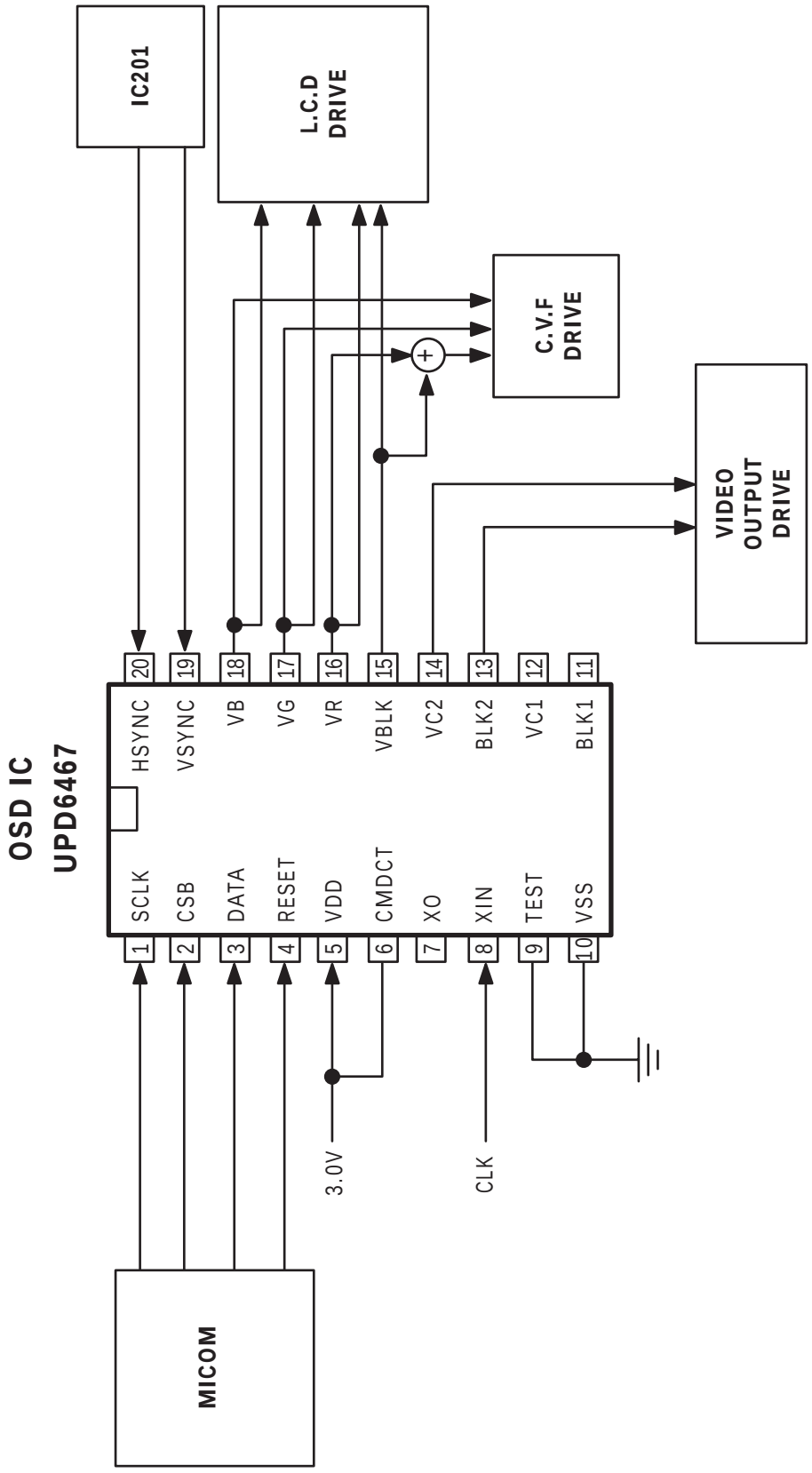


Fig. 6-10

<Table 6-7>

OSD Signal	Function
VOB	The letter signal (WHITE SIGNAL) which becomes the DISPLAY in the MONITOR
VOW	Outline letter signal of EDGE portion of the letter which becomes the DISPLAY in the MONITOR (BLANK SIGNAL)
OSD-R	The LCD/Viwe the RED signal which becomes the DISPLAY in the Finder
OSD-G	The LCD/Viwe the GREEN signal which becomes the DISPLAY in the Finder
OSD-B	The LCD/Viwe the BLUE signal which becomes the DISPLAY in the Finder
OSD-BLANK	The LCD/Viwe outline letter signal (BLANK SIGNAL) of EDGE portion of the letter which becomes the DISPLAY in the Finder

The OSD it operates a circuit

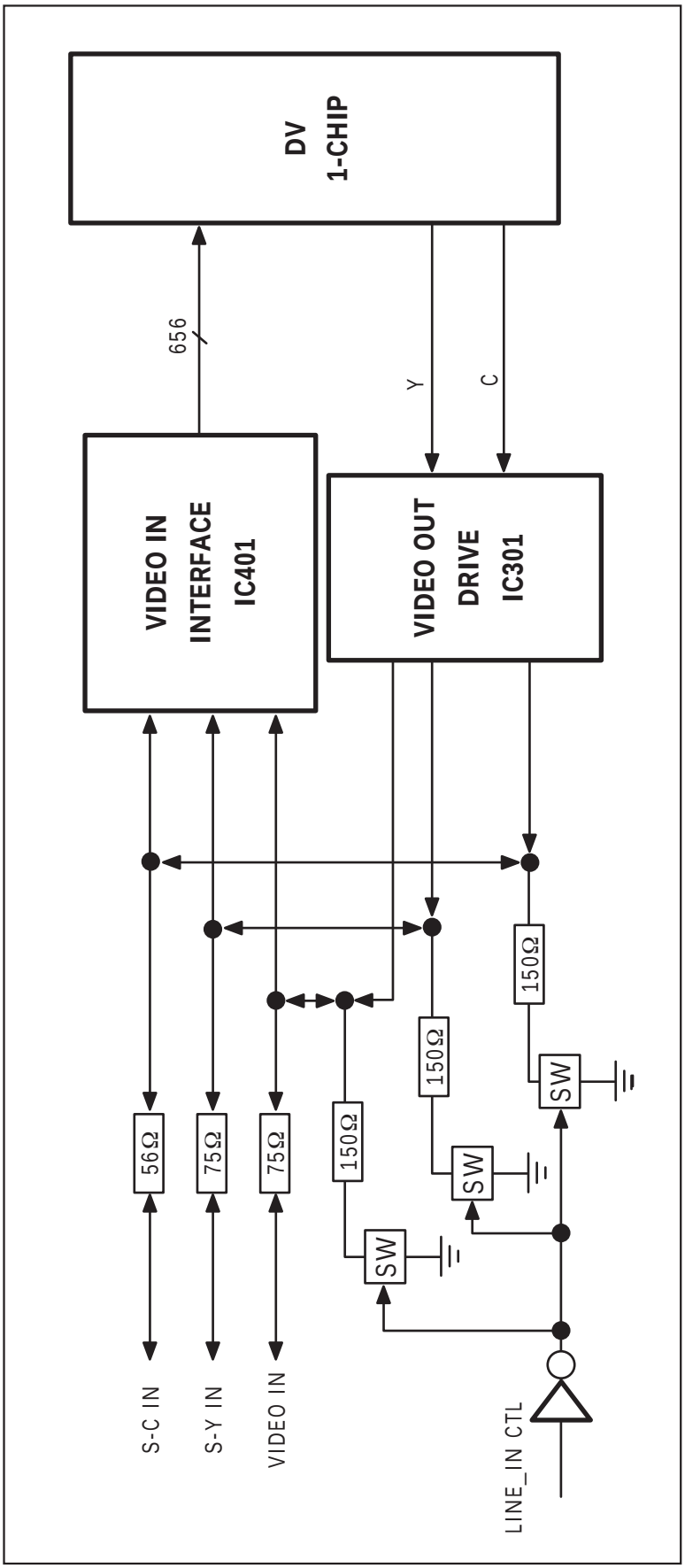
By the H/V-SYNC the location of letter of the Monitor and the LCD being decided, by the SERIAL DATA of MAIN MICOM are stored in CHARACTOR GENERATOR letter and the DISPLAY.
The DISPLAY type of letter comes to be classified with the letter which becomes the Display in the letter which becomes the Display in the Monitor and the LCD and View Finder to the Monitor it is indicated with the B/W and to LCD/View Finder the Display it is done with the Color and and.
Also the Date/Time to be recorded, to come, always in the Tape the signal which is recorded comes to be indicated by Date/Time on/dff the Monitor or in the LCD and Viwe Finder.

(1) VOB/VOW Signal

The CHARACTOR the signal which is output from the GENERATOR with VIDEO OUTPUT DRIVE IC being input the Mix and and with the Monitor, signal it becomes VIDEO signal and the Switching and it becomes it is output.

(2) OSD-R/G/B/BLANK Signal

The CHARACTOR the signal which is output from the GENERATOR does the DV 1Chip from Y/U/V signal and the LCD DRIVE IC which are output or from CVF DRIVE IC the MIX with each other and in LCD/View Finder PANEL the DISPLAY it is done and and.



LINE IN CONTROL	FUNCTION
L	OUTPUT MODE(VIDEO/S-VIDEO)
H	External LINE input (VIDEO/S-VIDEO)

Fig. 6-11

6-7-4 AV IN OUT Switching CIRCUIT

AV operation of IN circuit
The AV the IN becomes accomplished by DECORDER (IC401).
The VIDEO signal which is input depends to a SWITCHING circuit and the blood ten su becomes the MATCHING and it is input it comes with the IC401 and and to be changed with 656 DATA FORMAT.
The signal which is changed a LINE IN operation and and is input with the IC201 and it is accomplished.

The LINE the IN the input of COMPOSITE signal and S-VIDEO signal all is possible and by the menu the selection becomes accomplished.

Operational essential condition of IC401

<Table 6-8>

CTL PIN discription	FUNCTION
32	The CLOCK it decides with standard signal and the position CLOCK signal must be input
40	The LINE in order to accomplish a IN operation, with the signal from LINE IN MODE being maintained certainly with the HIGH, must maintain the LOW from mode other than the that
23, 24	The DECORDER it accomplishes an operation to give the order for, it decides with the place which it receives the IN/OUT position DATA must come to accomplish.

6-7-5 DVC TAPE PATTERN FORMAT

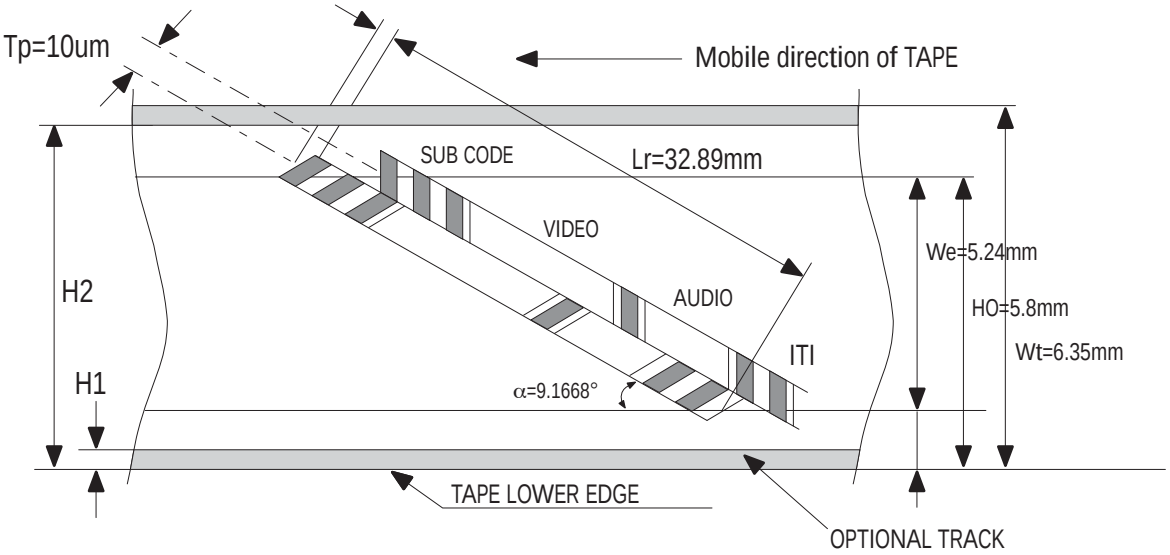


Fig. 6-12 DVC PATTRN FORMAT

SECTOR ARRANGEMENT ON HELICAL TRACK

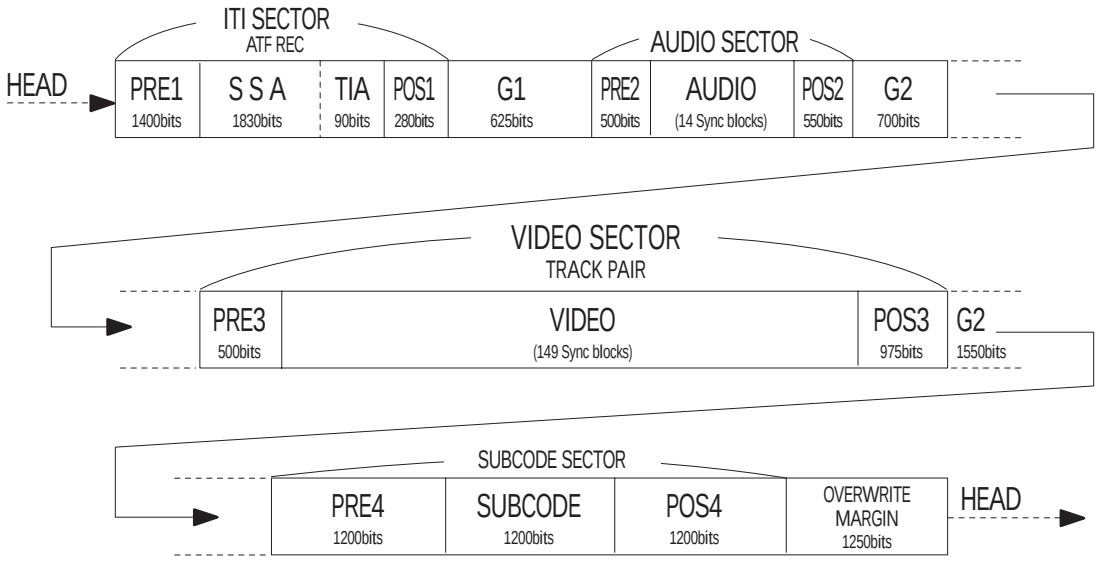


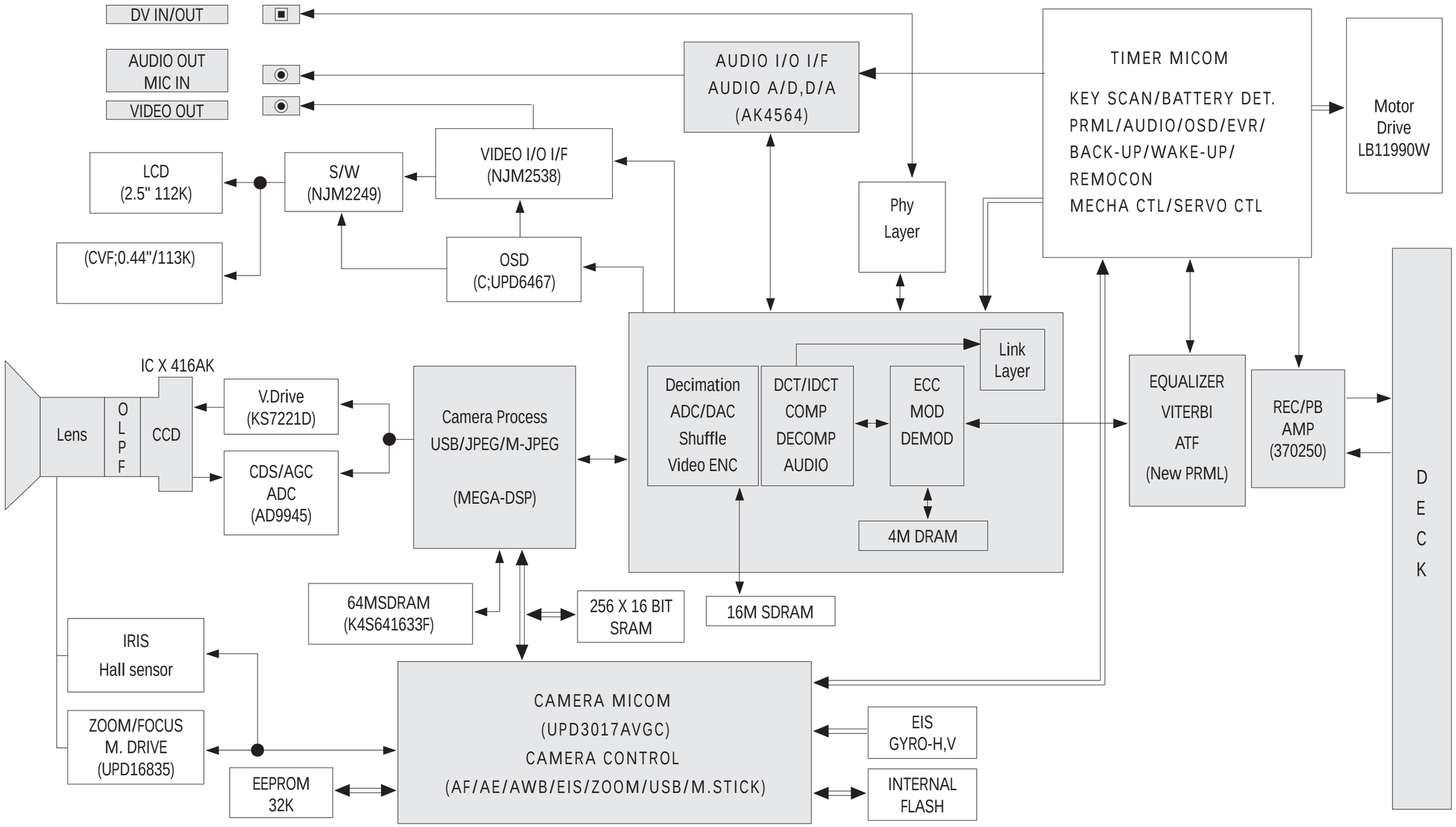
Fig. 6-13

6-7-6 ITU-R656(4:2:2)SAMPLING structure

<Table 6-9>

NO	ITEM		525/60 system	625/50 system
1	SAMPLING frequency Brightness (Y) signal Colour difference (Cr and Cb) signal		13.5MHz 6.75MHz	
2	Per line total pixel possibility Brightness (Y) signal Colour difference (Cr and Cb) signal		 858 429	 864 432
3	Per LINE ACTIVE PIXEL possibility Brightness (Y) signal Colour difference (Cr and Cb) signal		720 360	
4	Per FRAME ACTIVE LINE possibility		480	576
5	ACTIVE LINE number FIELD1 FIELD2		 23~262 285~524	 23~310 335~622
6	Quentization		The Y, the Cr and the Cb, it was identical, 8bits Quentization	
7	Analog image signal level and Quentization Relationship with the level which becomes	scale level: Y Cr,Cb	1~254 LEVEL 220 : WHITE LEVEL=235 BLACK LEVEL=16 LEVEL 225 : GRAY LEVEL =128	

9. Block Diagram



MEMO

6. Circuit Operating Description

6-1 System control & servo

6-1-1 Main function of timer microcomputer

The TIMER MICOM carries out a communication with camera microcomputer for control of each mode transition.
Its main functions are enumerated below.
1) Power ON / OFF control
2) Key function input
3) DV 1chip control / PRML control / Audio control
4) IEEE1394 control
5) Remote controller key input
6) OSD / LCD control
7) Mechanism control

6-1-2 Servo control

Rotation of drum motor and capstan motor of VCR block is controlled by SERVO circuit.
During REC MODE, drum servo controls the rotation phase of drum motor to synchronize video heads to record vertical Sync of video signal at the determined position on the tape.

Capstan servo controls rotation of capstan motor constantly to obtain constant tape speed and to record signal on the tape with the precise PITCH.

During playback mode, drum servo motor is controlled to obtain constant motor rotation and as a result, playback signal with minimum phase variation.
For video head to precisely trace record track and to obtain maximum level of playback signal, capstan servo controls motor.

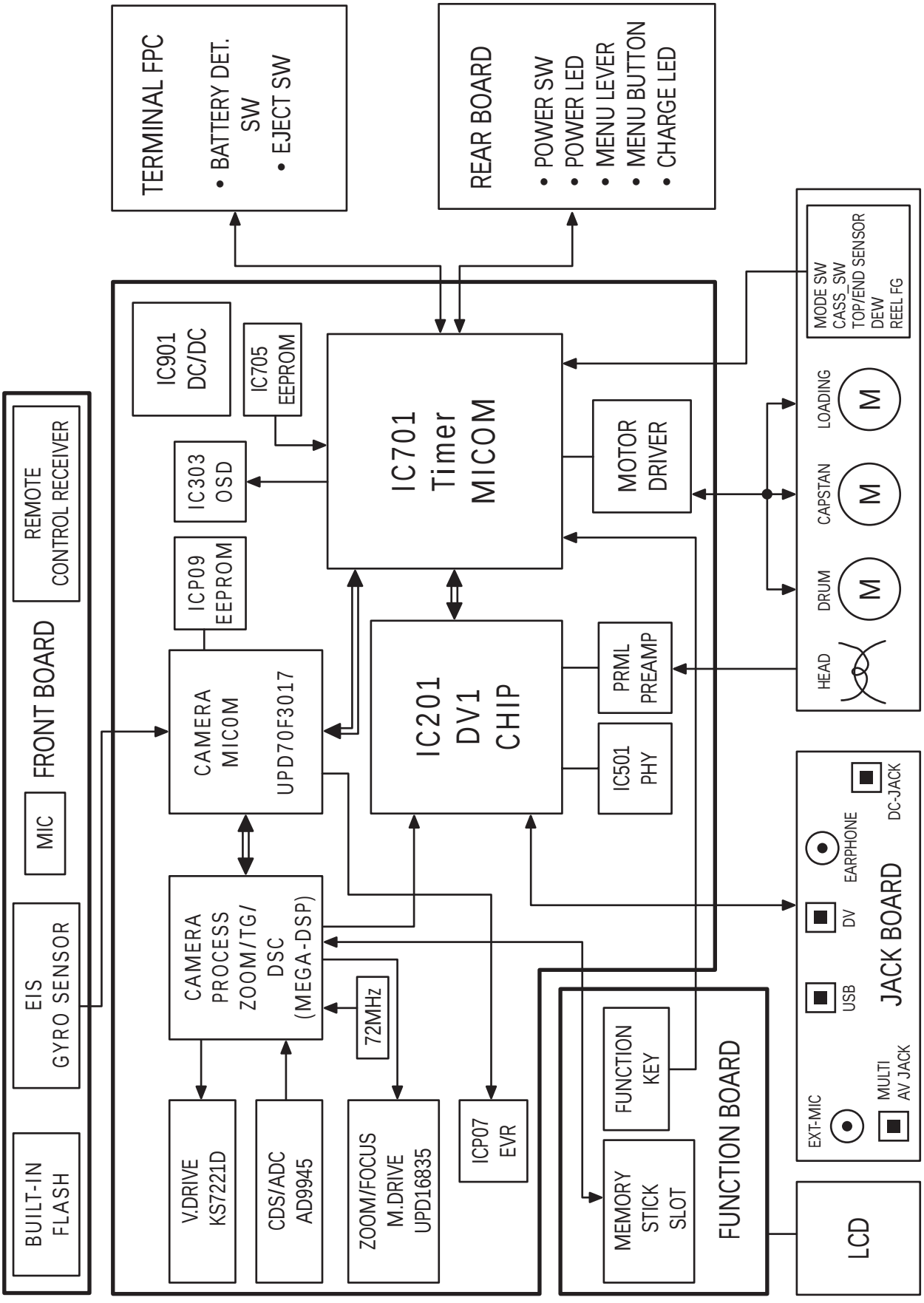

TERMINAL FPC
• BATTERY DET. SW
• EJECT SW
REAR BOARD
• POWER SW
• POWER LED
• MENU LEVER
• MENU BUTTON
• CHARGE LED
REMOTE CONTROL RECEIVER
FRONT BOARD
MIC
EIS GYRO SENSOR
BUILT-IN FLASH
IC901 DC/DC
IC705 EEPROM
IC303 OSD
ICP09 EEPROM
IC701 Timer MICOM
MOTOR DRIVER
CAMERA MICOM UPD70F3017
IC201 DV1 CHIP
PRML PREAMP
IC501 PHY
CAMERA PROCESS ZOOM/TG/ DSC (MEGA-DSP)
72MHz
V.DRIVE KS7221D
CDS/ADC AD9945
ZOOM/FOCUS M.DRIVE UPD16835
ICP07 EVR
FUNCTION KEY
MEMORY STICK SLOT
FUNCTION BOARD
MODE SW
CASS_SW
TOP/END SENSOR
DEW
REEL FG
HEAD
DRUM
CAPSTAN
LOADING
M
EXT-MIC
MULTI AV JACK
USB
DV
EARPHONE
DC-JACK
JACK BOARD
LCD

Fig. 6-1

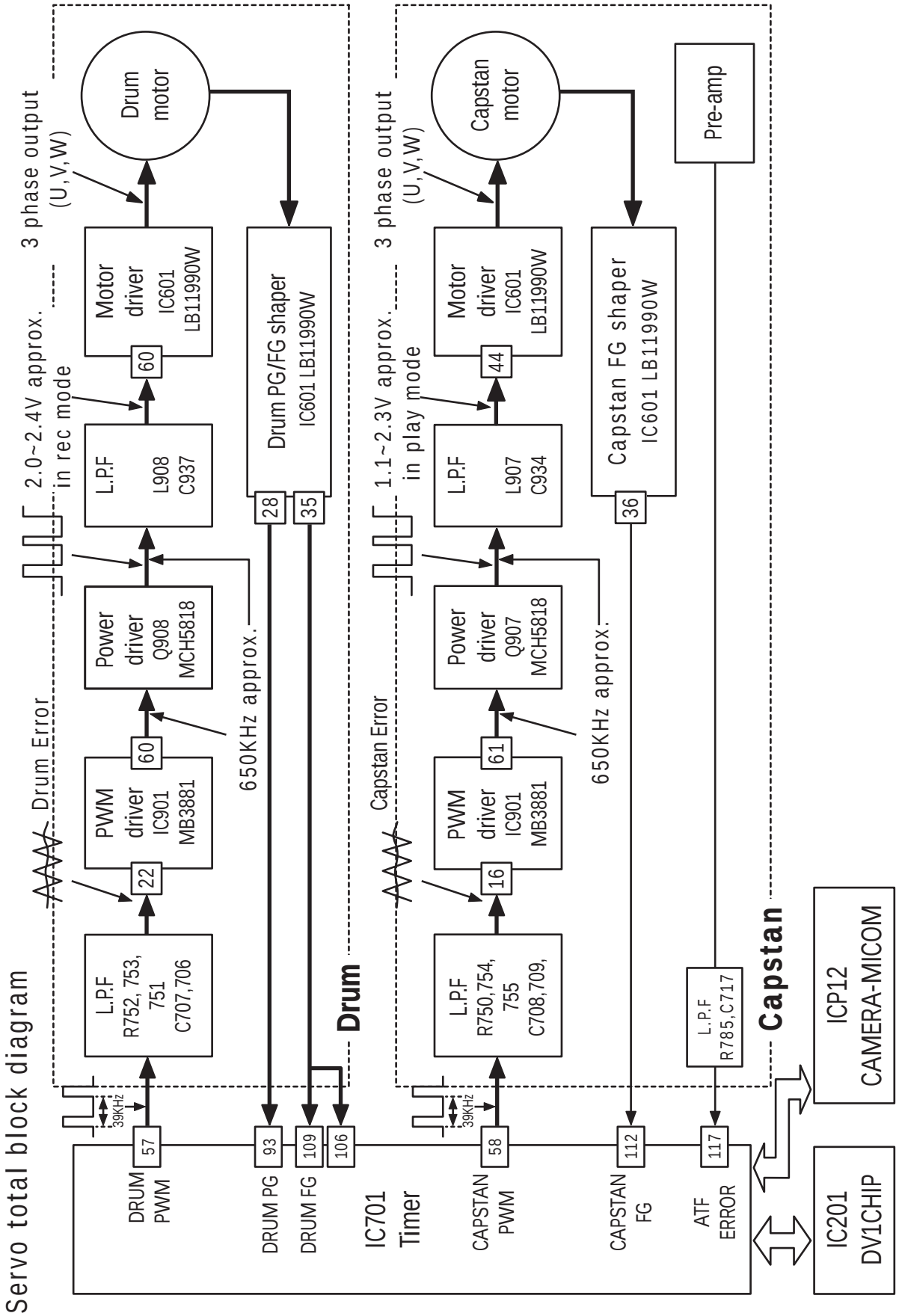

Servo total block diagram
Drum
Capstan
IC701
Timer
Drum motor
Capstan motor
Pre-amp
3 phase output
(U,V,W)
2.0~2.4V approx.
in rec mode
1.1~2.3V approx.
in play mode
Drum Error
Capstan Error
650KHz approx.
650KHz approx.
Motor driver IC601 LB11990W
Drum PG/FG shaper IC601 LB11990W
Capstan FG shaper IC601 LB11990W
L.P.F L908 C937
L.P.F L907 C934
Power driver Q908 MCH5818
Power driver Q907 MCH5818
PWM driver IC901 MB3881
PWM driver IC901 MB3881
L.P.F R752, 753, 751 C707,706
L.P.F R750,754, 755 C708,709,
L.P.F R785,C717
39KHz
39KHz
60
60
22
61
16
44
28
35
36
57
93
109
106
58
112
117
DRUM PWM
DRUM PG
DRUM FG
CAPSTAN PWM
CAPSTAN FG
ATF ERROR
ICP12 CAMERA-MICOM
IC201 DV1CHIP

Fig. 6-2

6-2 Error Check

6-2-1 DRUM-MOTOR ERROR

(1) In case of start up
  1) When the rotation pulse(DFG) has not been input for more then 5seconds since drum motor start up,
  2) When rotation speed is shifted by more then ±25% for 5 seconds, the mechanism is set to READY.

(2) In case of rotation
  1) When rotation speed during nomal operations is not inside of ±30% for 0.5 seconds,the mechanism is set to READY.

  : When drum-motor error is detected, Keys other than POWER and EJECT will not work.

6-2-2 CAPSTAN-MOTOR ERROR

(1) In case of start up
  1) When the capstan motor rotation pulse(CFG) is not inside of 80% for 2seconds compare to the regular quantity on the rotation.

(2) In case of rotation
  1) When the capstan motor rotation pulse(CFG) is under 100Hz for 0.5 seconds,the mechanism is set to READY.

6-2-3 LOADING-MOTOR ERROR

- There is no mode-switch's status varition within 5 seconds, after the loading motor turned on.

6-2-4 REEL ERROR

(1) In case of start up
  1) When the reel rotation pulse has not been input for more then 0.7 seconds since FF/REW stsrt up,
  2) When the reel rotation pulse has not been input for more then 0.4 seconds since mechanism unloadimg stsrt up, the mechanism is set to READY.

(2) In case of the tape running modes
  1) There is no reel FG variation of "H" ÷ "L" in the winding side for 5.4sec/running-speed.

6-3 Explanation of DC/DC BLOCK

DC / DC converter controls a step up / step down type of 8 channel, which is 5V drive(CH4), 3V drive(CH1), 2.5V drive(CH3), 1.8V drive(CH2), LCD Backlight 4V(CH7), drum, capstan motor drive(CH5,6) and 12V, -7.5V drive (CH8).
Channels are turned on and off depending on the voltage levels at the CTL-1 terminal(pin28), CTL-2 terminal(pin29), CTL-3 terminal(pin30), and CTL-4 terminal(pin 31).
The signal connected CTL-1~3 is VCR_DD_ON Signal and CTL-4 is LCD_ON coming from VCR Micom. (refer to Table1, 2)

<Table 6-1 Channel on/off setting conditions>

<table>
<tr><th colspan="4">CTL PIN</th><th colspan="5">Channel on/off</th></tr>
<tr><td>CTL-1</td><td>CTL-2</td><td>CTL-3</td><td>CTL-4</td><td>power</td><td>CH1,3,4,8</td><td>CH2</td><td>CH5,6</td><td>CH7</td></tr>
<tr><td>L</td><td>x</td><td>x</td><td>x</td><td colspan="5">OFF(Standby state)</td></tr>
<tr><td rowspan="8">H</td><td rowspan="4">L</td><td rowspan="2">L</td><td>L</td><td rowspan="8">ON</td><td rowspan="4">OFF</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td rowspan="2">H</td><td>L</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td rowspan="4">H</td><td rowspan="2">L</td><td>L</td><td rowspan="4">ON</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td rowspan="2">H</td><td>L</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>H</td><td>ON</td></tr>
</table>

x :Undefined

<Table 6-2 MODE TABLE>

<table>
<tr><th colspan="2">MODE</th><th>VCR DD ON</th><th>CAM DD ON</th><th>LCD ON</th></tr>
<tr><td colspan="2">POWER OFF MODE</td><td colspan="3">L</td></tr>
<tr><td rowspan="2">PLAYER MODE</td><td>LCD OPEN</td><td rowspan="2">H</td><td rowspan="2">L</td><td>H</td></tr>
<tr><td>LCD CLOSE</td><td>L</td></tr>
<tr><td rowspan="2">CAM MODE</td><td>LCD OPEN</td><td rowspan="2">H</td><td rowspan="2">H</td><td>H</td></tr>
<tr><td>LCD CLOSE</td><td>L</td></tr>
</table>

6-3-1 5V DRIVE

5V drive is controlled by Ch4 of PWM IC.
When CTL-1(28pin) is "H" and Vref(24pin) is "H"(2.5V), CH1,3,4,8 is operated.
PWM switching signal is out from OUT_4(57pin) and allowed to the gate terminal of Q915.
As source termianl of Q915 is always supplied with unreg voltage, Q915 is operated.
PWM output signal of drain terminal become DC 5V through coil(L922), condensor(C961, C962).

Each block of Camcorder that need 5V is supplied with this power.
To feed back DC5V to PWM IC, R923 and R924 are used as voltage divider.
As Divided voltage feed back and is compared with Vref(2.5V), dc 5V become constant by varing duty of OUT-4 switching signal.
Another 3V, 2.5V, 1.8V, Backlight 4V drive is also operated with similar way like 5V drive.
Also Transitor like Q916, Q917 is switch TR. Mode signal of base terminal supplies power to the block using switching TR
(ex:"CAM DD ON" ==>> CAMERA MODE)

6-3-2 DRUM, CAPSTAN MOTOR DRIVE

Drum, capstan motor drive is operated by CH5,6. When CTL-3(30pin) is "H" and cap.error, drum.error signal from micom is allowed to 16, 22 pin of PWM IC, CH5, 6 make PWM signal. When you perform PLAY, FF, REW, REC function etc, error signal is coming from micom(servo). PWM output waveform of OUT-5, 6 port is controlled by this error signal.
Next operation is similar with 5V drive explained above.

6-3-3 12V, -7.5V DRIVE

12V, -7.5V drive is operated by CH8 of PWM IC. CH8 is step up channel.
When output signal of PWM IC is allowed to base terminal of Q901, rectangular wave of Vpp 12V is occurred at the collector from coil(L903)
This rectangular wave is rectified through diode built on Q901 and rectified power is supply to each block that need that power.
Next operation is similar with 5V drive explained above.

6-4 Explanation of AUDIO Block

6-4-1 REC(CAMERA) MODE

Input signal of audio is coming to input port(internal : 40, 45 pin, external : 39, 46 pin) of audio IC(IC841) through MIC(Internal MIC & External Mic) cell.
Input signal go through amplifier built in IC and go output to 18, 19 pin of IC and then send to AV Jack.
If the mode is rec, amplified audio signal go output port of audio IC and simultaneously in the IC internal logic, analog signal is convert to digital to send digital signal to 14pin port of audio IC.
This digital signal go into DV 1chip and is written on tape through compression processing.

6-4-2 PB MODE

PB is reverse order of rec processing.
DV1 chip deshuffle compression data written on tape and send digital data to 13pin port of audio IC(IC841).
IC841 convert this digital data to analog signal to go out 18, 19 pin(audio output port) of IC841

6-4-3 SPEAKER

A/V JACK DETECT signal control speaker operation
When A/V jack is inserted to the set, speaker dosen't work Only when A/V jack is not connected to the set and LCD is opened, speaker work.

6-4-4 BEEP SOUND

Signal coming from voice IC(IC843 4pin) go into 25 pin of audio IC and then Beep sound opreates.
Sound of voice IC is fixed. Micom select the fixed sound through communication with voice IC when mode is changed or you push function button. Beep sound dosen't operate in the process of PB or REC

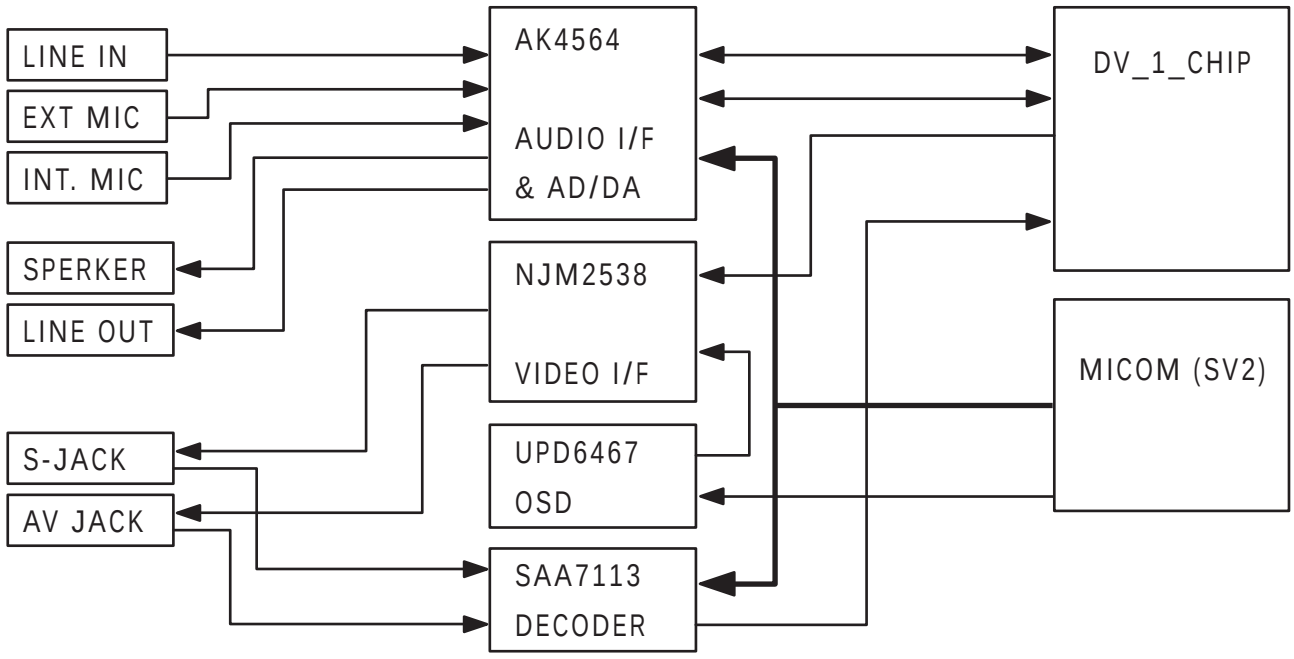


Fig. 6-3 AUDIO INTERFACE BLOCK

Audio I/F block performs in/out interface function of 16bits AD/DA.
When coming key input, beep sound signal go to speaker.

6-5 CAMERA BLOCK

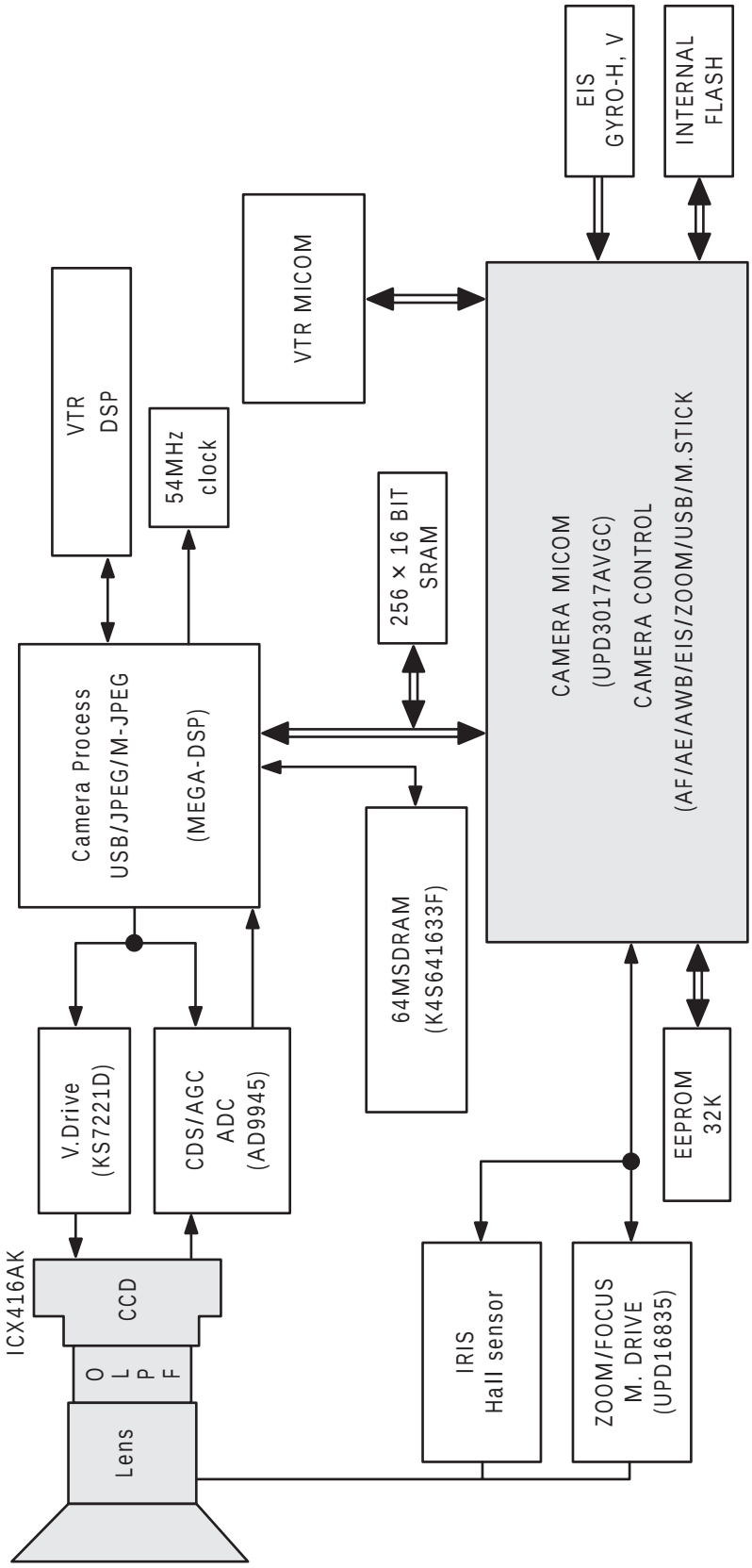


Fig. 6-4 CAMERA BLOCK

6-5-1 CAMERA MICOM Initially operation

(1) Practice(Output Of Blue Screen) VCR MUTE and Control power as bing Micom recognizes action mode when the power is on in the SET.
- POWER is ON in the CAMERA MODE

<Table 6-3>

POWER/MODE	CAMERA	OFF	VTR	
CAM5V	O	X	X	ICP02,ICP04,ICP05,ICP06(IRIS,HALL BLCOK), STROBO BLOCK
CAM3V	O	X	X	ICP03(CDS/AD), ICP08(MOTOR DRIVE),EIS BLOCK
DSP3.3V	O	X	O	ICP11(DSP),ICP12(CAMERA MICOM),ICP10,ICP13,ICP09
DSP 2.5V	O	X	O	ICP11(DSP)
CCD 15V	O	X	O	ICP01 (CCD V_DRIVE)
CCD -7.5V	O	X	O	ICP01(CCD V_DRIVE)

(2) When the power is ON in the MICOM, it starts a oscillation of 20MHZ , the RESET signal which comes from VTR MICOM it waits.

(3) It reads the DATA which in the EEPROM (ICP09) is stored in relation IC DATA transmission (CDS_AD / DSP) by means of SERIAL communication / or PARARELL communication.

(4) It accomplishes an initially anger operation relation of CAMERA
- CCD KIZU compensation : It controls SLOW SHUTTER from the condition which closes the iris of the LENS and the KIZU (WHITE DEFECT) of the CCD it detects and and it compensates.
- ZOOM / FOCUS OF LENS RESET CHECK:
  It moves the ZOOM and FOCUS motor and it searches for an the mechanical structure RESET location. Location of the ZOOM LENS it moves with a BACK-UP location (Previously condition of power off)from RESET location
  › When the problem occurs in the RESET CHECK(10 second or more), the screen light lately, when the ZOOM operates, the focus is not right.
- AE initially operation :
  It is a place where the use condition of present time dawns it is a dark place and the possibility of knowing not to be with regual data the iris after opening in order to arrive to AE set point, it controls the IRIS.
- AWB initially operation:
  In order for and to receive color temperature,brightness of screen and the location of ZOOM of present time after controlling at regual data, the WB MAIN ROUTINE to be executed.

(5) When the operation is completed, it delivers a completion signal in the VTR MICOM and the VTR MUTE(BLUE SCREEN) is released and the screen is output.

6-5-2 CCD and High-speed transmission signal DELAY ADJUST

The CCD uses the ICX416AK of the SONY.
Total number of pixels is 1.33M pixels. 1/4INCH .It is applied with commonness NTSC/PAL.It has compansational area of trembling hand of 33%.

<Table 6-4>

Structure	Number of pixels	Horizental(H)	Vertical(V)
Total Number of pixels	1,330,000	1363	975
Number of effective pixels	1,250,000	1290	966
actual effective pixels(DSC)	1,230,000	1280	960
record pixels 4:3 NTSC/PAL	690,000	960	720

When actual effective pixels possibility photographing the picture, becomes the maximum SIZE. Therfore the maximum SIZE of the picture which it provides from this model becomes the 1280(H)X960(V) pixels.
The pixel which other than 4:3 screens(690,000 pixels) which it uses from the camera tape record mode remains becomes the compansational area of trembling hand.
The horizontality transmission becomes the drive with the 36MHz clock.
It is planned with the structure where the DELAY ADJUST of the ccd horizental driveing pulse and high speed pulse is possible.
The signal where the Delay Adjust is possible like is appearing in above the picture is H1, H2, RG, SHP, SHD and ADCK signal.
SHD,SHP,RG signal is possible to adjust Delay of 1ns per 1step of data.
And H1,H2 signal is possible to adjust the width and phase of pulse of 1ns per 1step of data.
The TIMING set of the SAMPLING pulse of the CDS/AGC/AD IC and CCD driving is very important.
And that to form or degree of the noise an effect it gives it is necessary a lot, it sets the separate TIMING from the MODE which is judged.
Vertical transmission from DSC mode is not possible to read a whole pixel in 1 FIELD.
Therefore it reads a whole pixel in 2 field.
Becomes the maximum 15 frame per second. So the DSC mode becomes the reason where the screen is not continued.

6-5-3 PREPROCESS MODULE

The following objects are available in the Preprocessing Module

- ADC delay compensation
- Digital Clamp
- White Fault Detecting
- Fault Sorting
- Fault compensation

6-5-4 Luminence Signal process Module

We perform the following abilities because of making the luminence signal which are made by outputs (s1, s2) of CCD.

- Color Suppression (Highlight, Edge Suppress)
- Horizontal Aperture
- Vertical Aperture
- After controling aperture Non-linear characteristic process
- Noise Slice
- Level Clip
- Gamma Compensation
- Detail Enhancement
- High-Light Aperture Control
- Gain Control of Luminence signal
- Art Freeze
- Posi / Nega Effect of image

6-5-5 COLOR SIGNAL PROCESSING

Using output of the CCD,the processing creates color difference signal (R-Y, B-Y) for the output of composite color signal and so delivers with the scale module. And it generate the signal for the white adjustment and so delivers with OPTICAL DETECTION MODULE.

- The color signal separation which uses the LPF and LPF function.
- R,G,B generation function
- white and black adjustment function
- Gamma Compensation function
- function of Color difference signal generation
- Control ofHue compensation and color difference signal gain
- Color suppression function of high luminance / boundary
- Posi / Nega function
- Color Key function
- Blue Effect function

6-5-6 Digital Scale

Against the luminance and color signal,with independent digital zoom process of a horizontal and vertical direction the process materializes digital scale image of high power added to optical scale.

- 256 Step Digital Scale due to Cardinal Spline Algorithm
- A vertical expansion of image due to control of CCD Vertical Drive
- Execution of a horizontal expansion and horizontal,vertical interporation due to built-in 2H DELAY LINE control
- 4:2:2 Source Format
- The function of independent scale power application for a horizontal,vertical direction
- Compensation for unintentional hand of a horizontal direction and sub-pixel of vertical direction
- 64 Step Mosaic function
- Half/Full Mirror function

6-5-7 OPTICAL DETECTOR

It receives luminance signal and a color signal from the Luminance Block and Chroma Block and so express the data included Auto Focus(AF), Auto Exposure(AE), Auto White Balance(AWB) from inside the Window area through MICOM .And it make window pulse because of displaying each window area (AF, AE,AWB).

- Integral calculus function of 1 Field luminance signal from inside the Window1 area for the AF .
- Integral calculus function of luminance peak by line from inside the Window1 area for the AF .
- Function of luminance level clip count from inside the Window1 area for the AF .
- Integral calculus function of 1 Field luminance signal from inside the Window2 area for the AF .
- Integral calculus function of luminance peak by line from inside the Window2 area for the AF .
- Integral calculus function of 1 Field luminance signal from inside the Window1 area for the AE .
- Integral calculus function of 1 Field luminance signal from inside the Window2 area for the AE .
- Function of luminance level clip count from inside the Window1 area for the AE .
- Integral calculus function of 1 Field R,G,B signal from inside the Window area for the AWB .

6-5-8 Sdram controller

Following to each operation, it allocates a MEMORY area each and it uses. It is composed to be possible for the high-speed transmission.

- Corresponding to 16bit, 4bank SDRAM
- Connection of MJPEG Controller
- DMA tranmission function
- INITIALIZE fuction
- Function of SCALE conversion
- Function of OSD indication
- Function of LINE indication

6-5-9 Jpeg controller

It composes JPEG to be possible for the high-speed control with the HARDWARE. And it applies the table which corresponds with it by the set of the REGISTER .

- Compression and extension are based upon ISO/IEC10918-1 JPEG STANDARD BASELINENPROCESS.
- Compression and extension FORMAT : corresponding to 4:1:1, 4:2:2
- MAKER automatic addition and interpretation function
- TABLE
  Quantization table : Three types of color component
  HOFMAN TABLE : Four types of DC and AC component against component of two types

6-5-10 PLL controller

It provides the 54MHz to the VTR blcok.

- Converting 54 MHz to 36MHz
- external clock mode

6-5-11 USB 1.1 controller

It transmits the data in ISO transmission method of the USB.

- USB 1.1 standard (12Mbps)
- ISO transmission method

6-5-12 DMA controller

It transmits the data in ISO transmission method of the USB.

- CANNEL number : 4 CANNEL
- ADDRESS space : 8M BYTE
- Bit of transmission DATA : 8BIT, 16BIT
- The maximum transmission frequency : 524288 times

6-5-13 Memory Stick Controller

The inside of memory stick is composed of the flash memory and controller.
A Function of controller is control of the plural flash memory , absorption of quality difference of various flash memory,the error amendment which responds in various flash memory error quality and conversion of parallel and serial data.

- 8 bytes (4 wards) FIFO is composed of buffer for each transmit and receive.
- It is composed of CRC circuit.
- Until 80 Mhz it delivers (when using SONY C5MX-HB-T the library which is an external input)
- DMA support
- When INT is compensated from M/stick execution of automatic command execution can put out or turn on.
- MagicGate support
- All registers (for SCAN) is embodied with positive edge F/F.
- The protocol from CPU is started with the fact that it writes in the command registers.
- The Data by the DMA or when the data period comes in, by the interrupt of the CPU becomes the request .
- The RDY timeout period comes to become the set by a serial clock number.
- When also the timeout happens,The Interrupt is a possibility becoming the output for the CPU.
- It is composed of 4 bit parallel port.
- It acesses by 16 bits .
- The output form FIFO is little endian.
- At the time of power save mode one the Pws_clk is fixed with Low level.

6-6 CAMERA ADJUSTMENT

6-6-1 ADJUSTMENT METHOD IN SET(SC-D93)

For ITEM adjustment:

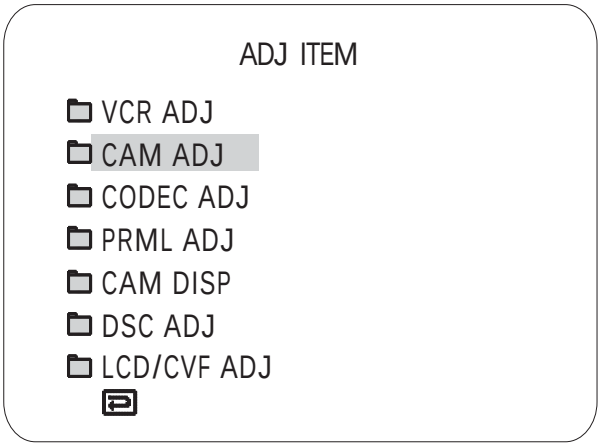
- We can start Control ITEM Menu when we push MEMORY MIX KEY and BLC(STOP) KEY in 3 second during STOP.

Select adjust ITEM:

- Find the ITEM moving the VOL/MF DIAL up and down.

Start adjust mode:

- 360We can start Control Mode which we select when we push the VOL/MF Enter KEY.



<Table 6-5>

FUNCTION OF EACH BUTTON IN ADJUSTMENT MODE		
CONTENT	SET KEY	NOTE
ADDR UP	EASY KEY	
ADDR DOWN	DISP KEY	
DATA UP	VOL/MF UP KEY	
DATA DOWN	VOL/MF DOWN KEY	
CONFIRM	VOL/MF ENTER	Push the dial key
DATA SKIP	MENU KEY	Add 16 to DATA
NEAR	MF/AF DIAL	Only SET CAM adjustment
FAR	MF/AF DIAL	Only SET CAM adjustment

6-6-2 OMEGA- PJ DVC CAMERA ADJUSTMENT

(1) The adjustment method in SET

* IN CAMERA MODE

PUSH THE MEMORY MIX KEY + BLC(STOP) KEY in 3second.

› DISPLAY MENU OSD

- VCR ADJUST (CANNOT ADJUSTMENT)
- CAMERA ADJUST
- CODEC ADJUST
- PRML ADJUST
- CAMERA DISPLAY
- DSC ADJUST (CANNOT ADJUSTMENT)
- LCD / CVF ADJUST

* FUNCTION OF EACH BUTTON

1) CONFIRM ; ENTER(VOL / MF DIAL)
2) ADDRESS UP / DOWN ; EASY / DISPLAY
3) DATA UP / DOWN ; VOL / MF DIAL
4) DATA SKIP (Add 16 to DATA) ; MENU KEY
5) NEAR / FAR ; MF DIAL

6-6-3 FLOW CHART

<Table 6-6>

	CONTENT	ADJUSTMENT METHOD	SPEC	NOTE
0	INITIAL ADJUSTMENT	① CONFIRM DATA "AA"TO ADDRESS "0DF"	WHEN CHANGING ONLY EEPROM , ACCOMOLISHMENT	
1	HALL ADJUSTMENT	① CONFIRM TO ADDRESS "0CD"		
2	IRIS ADJUSTMENT	① CONFIRM TO ADDRESS "0CE" (AFTER HALL ADJUSTMENT ADJUST IRIS)		
3	AWB ADJUSTMENT (INDOOR ADJUSTEMT)	① ADJUSTMENT CONDITION : ADJUST 3100°K GRAY SCALE CHART WITH THE 40µs ② CONFIRM TO ADR."0D4"(3100°K ADJUSTMENT)		
4	AWB ADJUSTMENT (OUTDOOR ADJUSTMENT)	① ADJUSTMENT CONDITION : ADJUST 3100°K GRAY SCALE CHART WITH THE 40ß¡ ② CHANGE ADDR. "0D5" (5100°ΔK ADJUSTMENT) ③ CONFIRM TO BE LOCATED "C16" FILTER ON THE FRONT LENS		
5	LENS ADJUSTMENT	① ADJUSTMENT CONDITION:JUST ADJUST COLLIMETER ② CONFIRM TO ADDRESS "0D0"		
6	ZOOM VR ADJUSTMENT	① CONFIRM TO ADDRESS "0D6"		
7	3M LENS ADJUSTMENT (HAS NOT COLLIMETER)	① ADJUSTMENT CONDITION : ADJUST TO BE LOCATED FOCUS CHART WITH THE 3M ② CONFIRM TO ADDRESS "0DE"		

6-7 The VIDEO section operation explanation

6-7-1 BLOCK diagram explanation

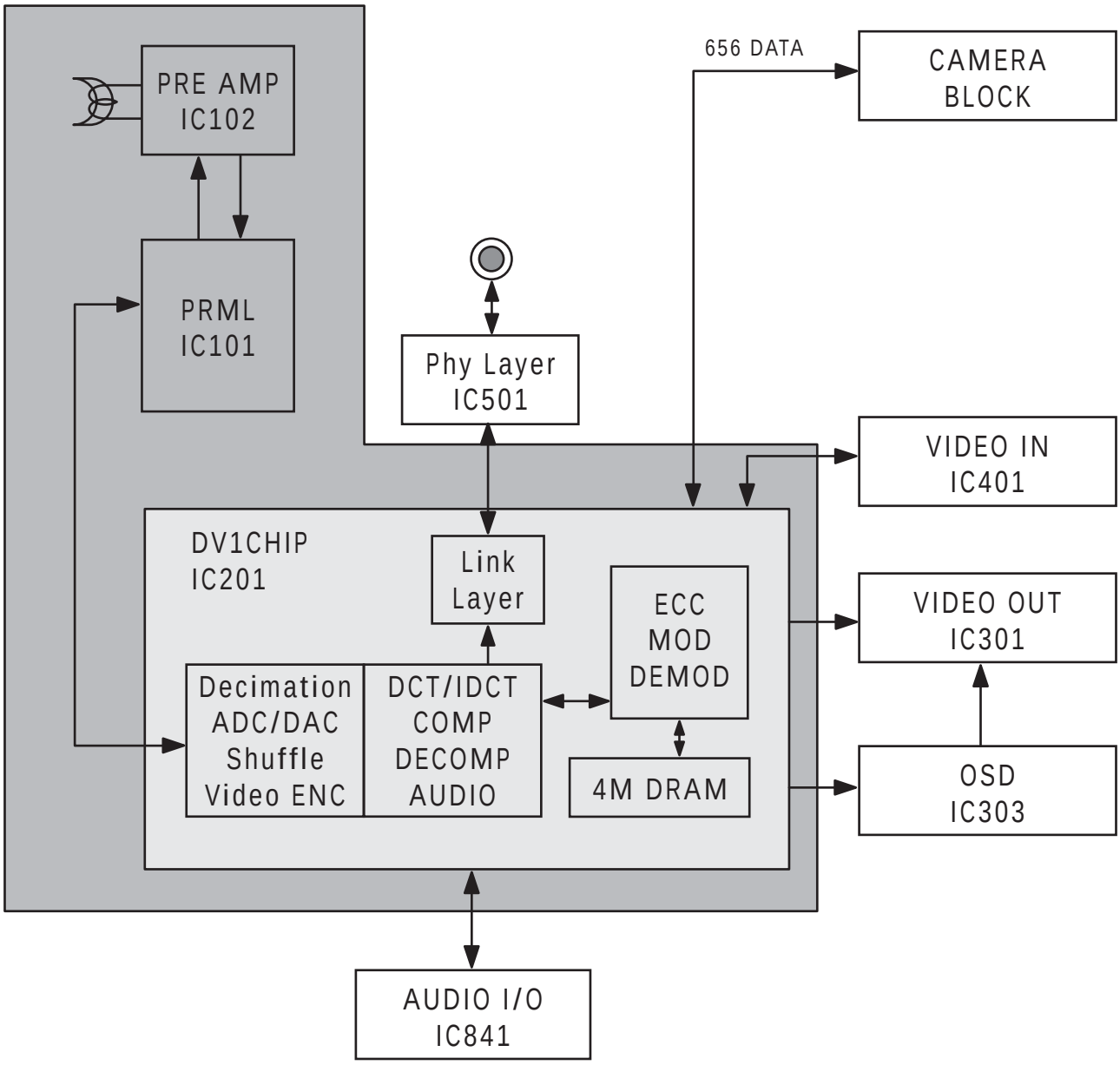


Fig. 6-5 video BLOCk composition

VIDEO composition of BLOCK

(1) PREAMP BLOCK : It amplifies the signal which is input from the HEAD

(2) PRML BLOCK : In order to be suitable in image signal control, it controls the PRE AMP output Signal.

(3) SIGNAL PROCESS : Recording and playback image signal process

(4) IN / OUTPUT DRIVE : It outputs a video signal it inputs at outside the circuit for

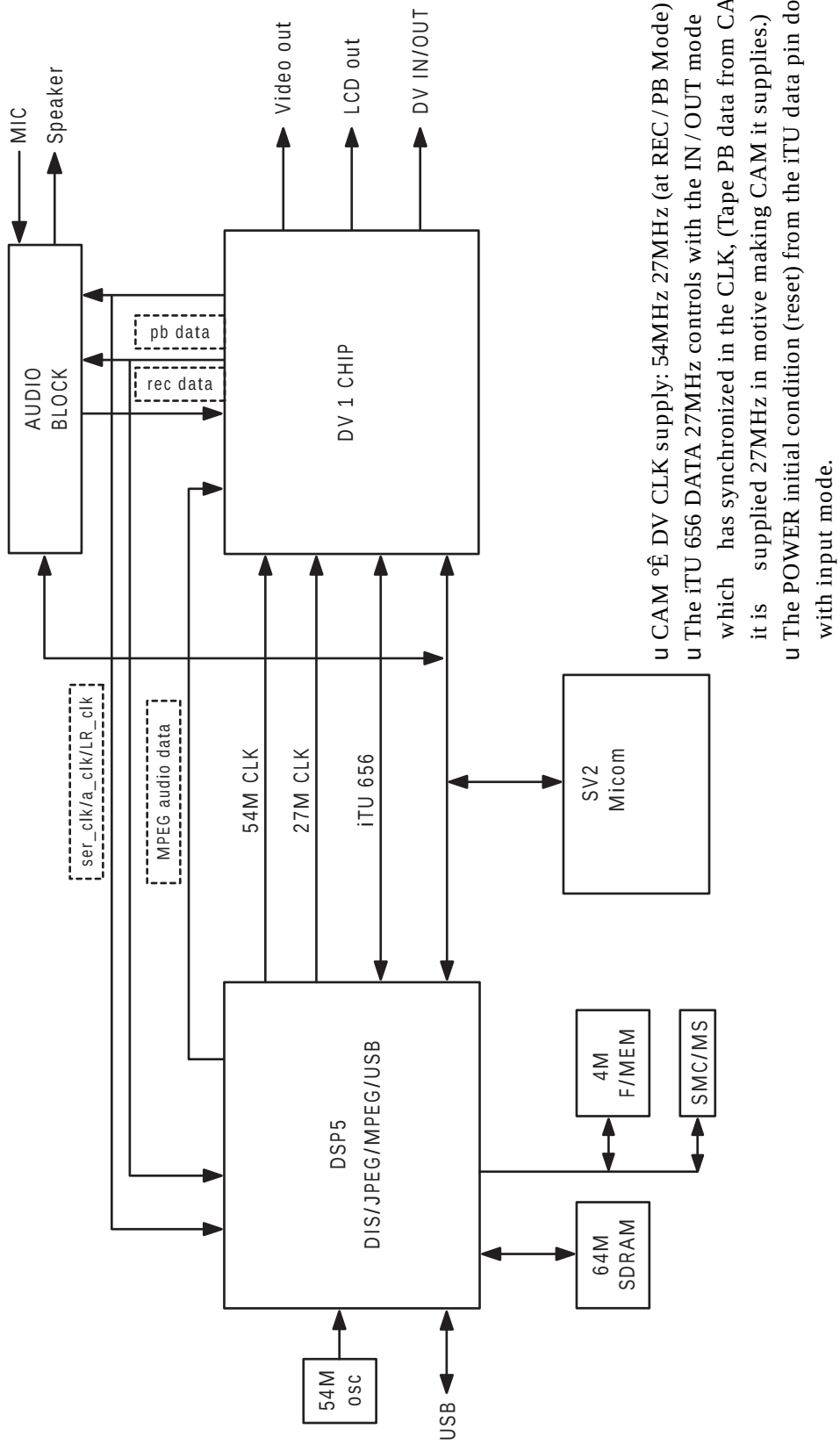
(5) OSD BLOCK : The character occurrence and mix circuit

6-7-2 The operation explanation against the PRML

The PRML, from Micro Processor by the Control Signal of Serial Enable / Data / Clock the each mode (the SP-PB, the LP-PB and SP-Forward / Reverse Search, the LP-Search, the SP-Slow and LP-slow etc) to follow from the BLOCK and data control in order to be done.
Also, the Head S / W Pulse is input and the possibility the signal control becoming accomplished continuously from the High segment and the Low segment of remaking hour input signal (Envelope Output) in order to be, the Control it becomes.
The DV-1chip (Channel Block) from with Power Down, the PB-High and Adaptive High to receive a same control signal and to Recording Time period to stop (Power Down), to Playback Time period the possibility signal control of operating normally in order to be, an operation and and must come to become the control.
With the DV-1chip (Channel Block) 41.85MHz it makes Playback Clock and Playback Data and it supplies with there must be it will be able to execute a Playback operation.
Also, when from the DV-1chip (Channel Block) 41.85MHz supply to receive a signal, a stable remaking operation the input signal which is unstable from the PREAMP being input to (Search Mode or tape damage etc) to give a signal and with PB Clock paragraph exchange in order to execute. te.
From the PREAMP remaking output signal of Differential input (DIP and DIN) supply receiving AGC, the Dropout and Analog qualizer and Digital Equalizer, 1+D, it accomplishes the Function of the Viterbi back and 41.85Mbps with the DV-1chip (Channel Block) it supplies PB data.
From playback signal the highest cycle prisoner of remaking signal 20.925MHz it executes a X2 process and 41.85MHz with the DV-1chip (Channel Block) it supplies PB clock.
Also, from remaking output signal it executes ATF Signal Processor and F0 / F1(465KHz) / F2(697.5KHz) it makes it supplies with Capstan Control it uses with Micro and Processor ATF coltrol ATF Error signal .
From the DC / DC 3.3Vdc and 1.8Vdc it uses 2 branch all the member with the standard all the member of the block which is necessary to the control of control signal of the supply receiving inside operational all the member and outside and. Also, by outside option (pull up or pull down) the inside 1.8V it will be able to operate the regulator.
This time the external all the member 3.3V the use is possible with the single all the member.

6-7-3 DSP5 & DV 1chip interface

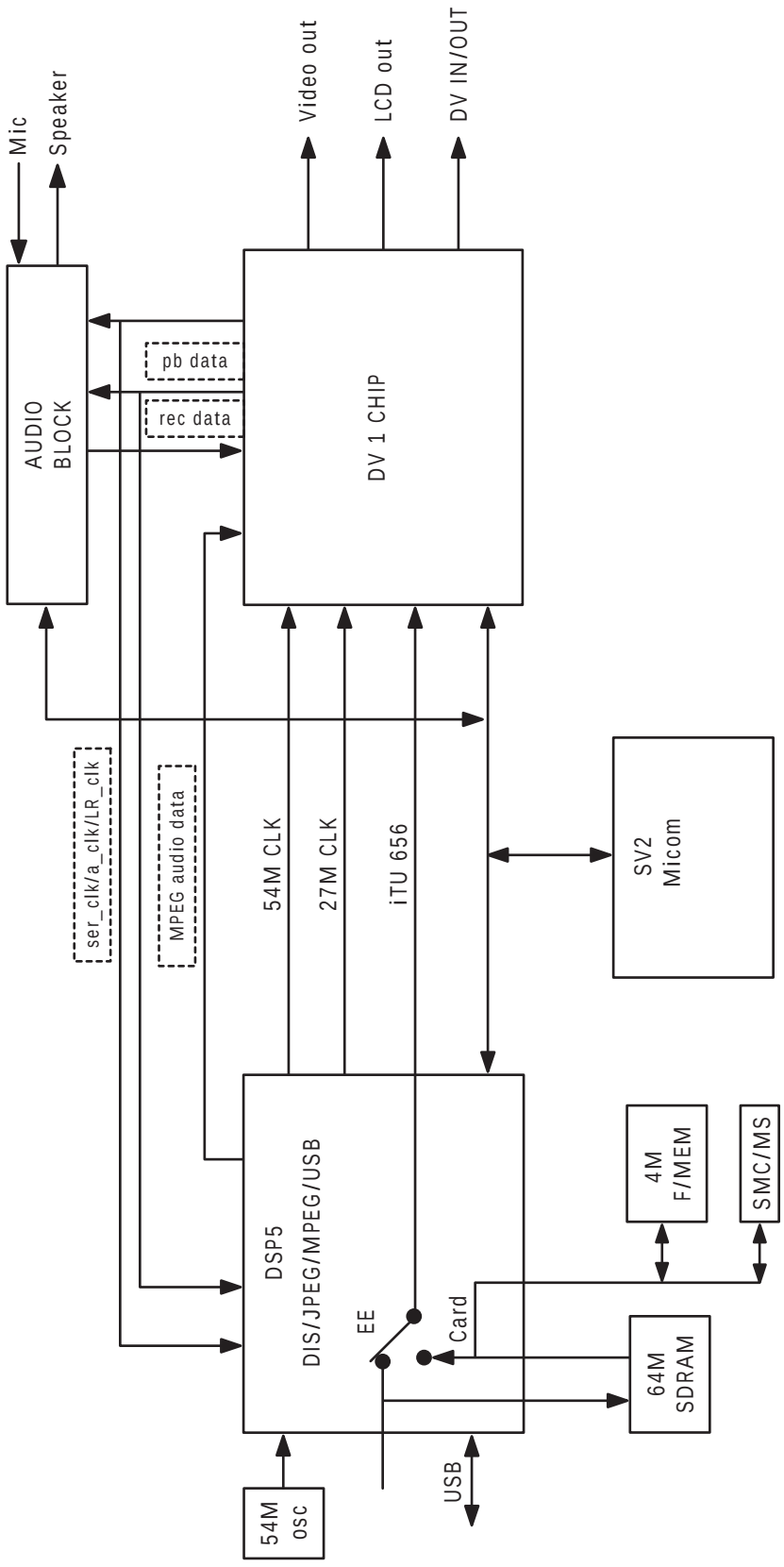
(1) System block diagram



u CAM ºÊ DV CLK supply: 54MHz 27MHz (at REC / PB Mode)
u The iTU 656 DATA 27MHz controls with the IN / OUT mode which has synchronized in the CLK, (Tape PB data from CAM it is supplied 27MHz in motive making CAM it supplies.)
u The POWER initial condition (reset) from the iTU data pin does with input mode.

Fig. 6-6

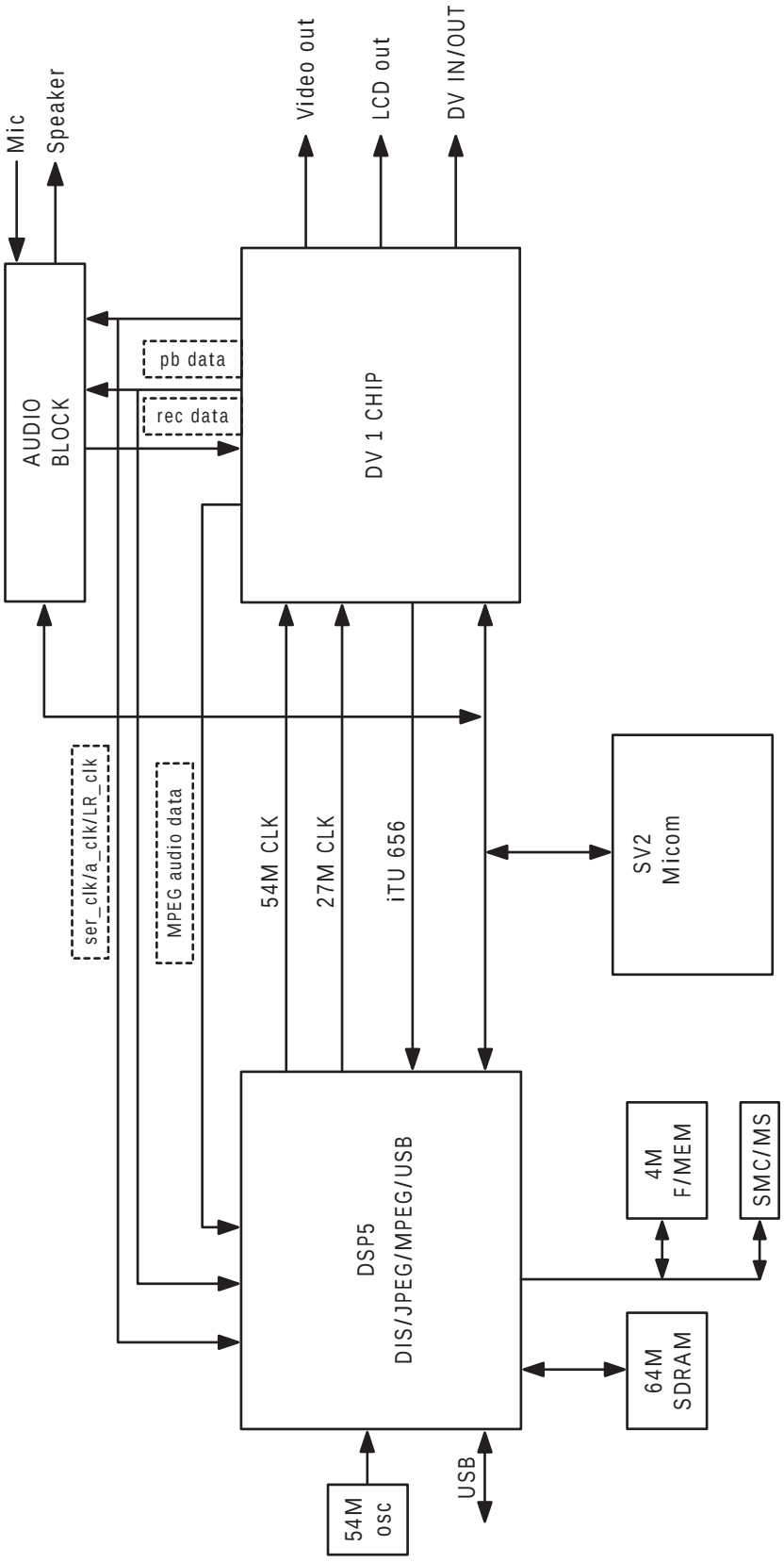
(2) CAM EE & Memory(=Card)Recording mode



- The Memory the Card or camera EE Mode selection controls from the micom.
- It extends before Mode and the DSP5 the DV 1chip 54MHz, 27MHz supplies the clock.

Fig. 6-7

(3) Tape Playback & Memory Recording Mode



- 27MHz The clock the CAM °Ê supplies in the DV and 54MHz it becomes synchronization.
- The Card from recording hour DV chip field and data the capture it supplies in the DSP5. (Mode transient from micom control box)
- Eastern image card recording hour audio data max = 48KHz * 16bit * 60 seconds (60 second card recording hours)
- The Tape remaking audio clock information (48K / 32K) supplies (the Audio data length 48K / 32K public affairs 16bit is from the Micom)
- The Tape the PB data from the dsp5 is output 27MHz supplies in synchronization making dsp5.

Fig. 6-8

(4) Memorystick playback & Tape recording mode

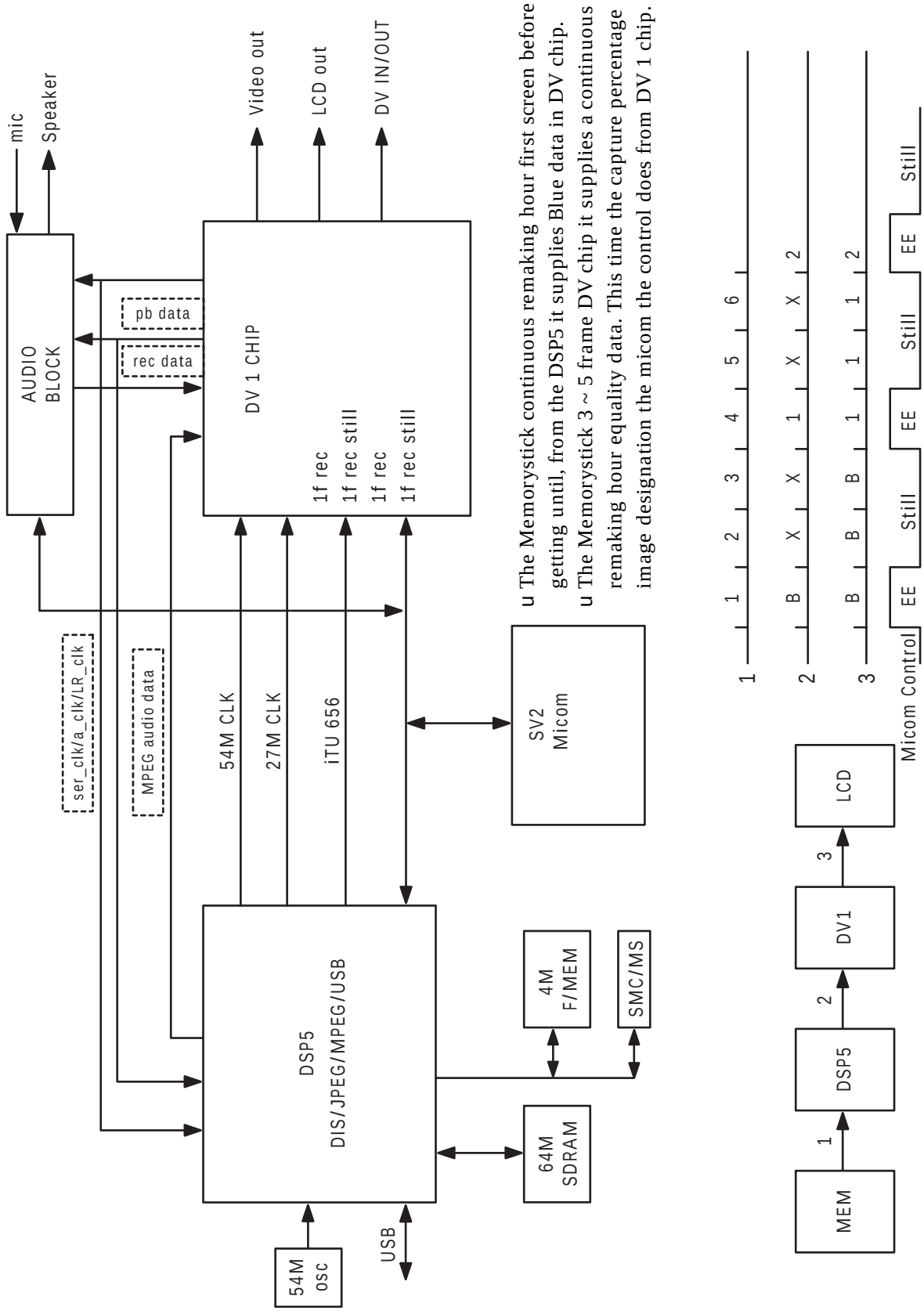


Fig. 6-9

- The Audio the ser_clk / a_clk / LR_clk / PB_data the dsp5 and Audio block own jointly
- The Audio the REC_data MPEG remaking hour dsp5 output and Audio block output the DV 1chip from it uses the MUX and it selects, (this time DV 1chip audio PB_data pin "low" level or hi-Z it controls)
- MPEG for an eastern image Card remaking hour speaker output the DV 1 chip receives Card REC_data and Audio PB _data the bypass it makes with the pin.

6-7-3 O.S.D. CIRCUIT

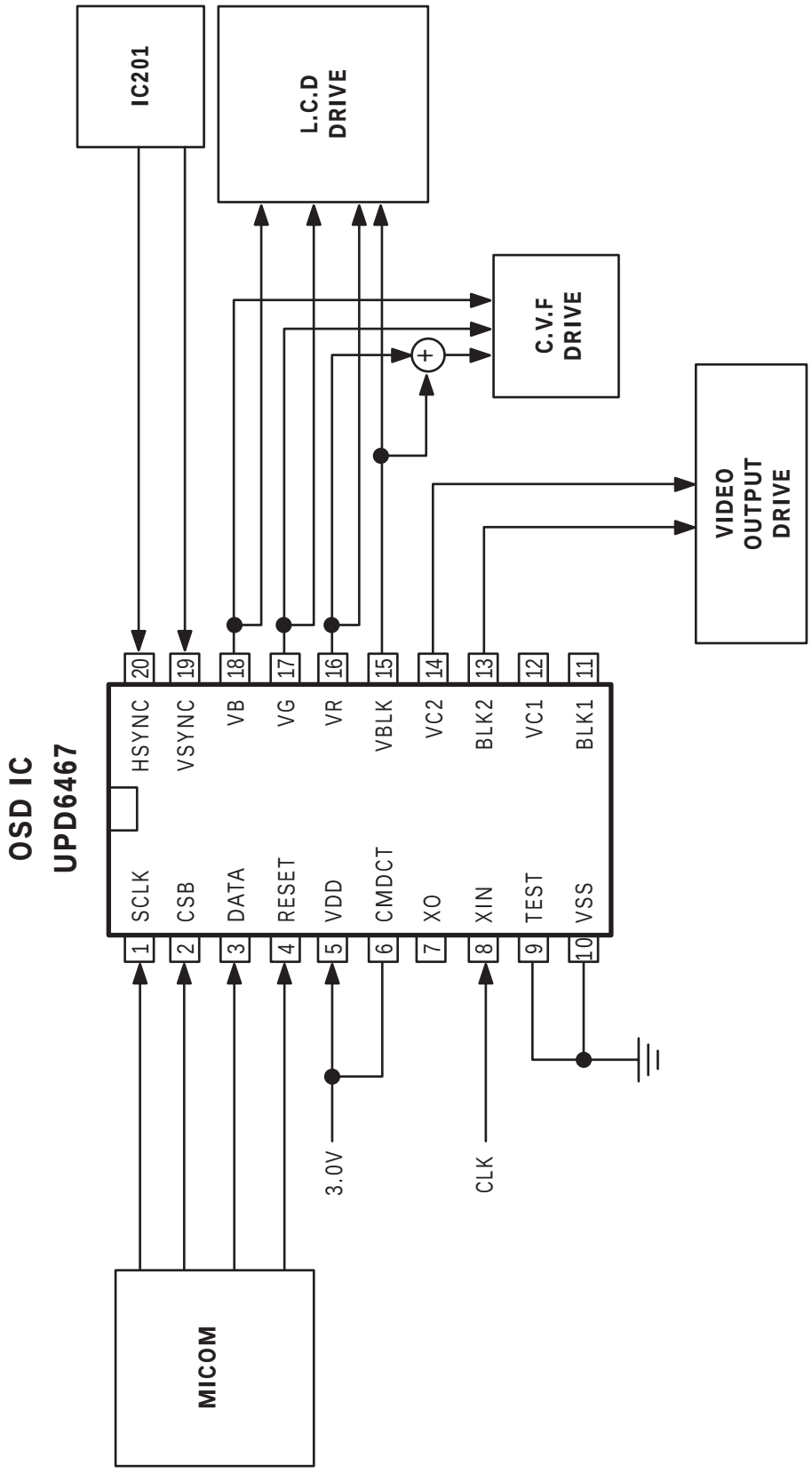


Fig. 6-10

<Table 6-7>

OSD Signal	Function
VOB	The letter signal (WHITE SIGNAL) which becomes the DISPLAY in the MONITOR
VOW	Outline letter signal of EDGE portion of the letter which becomes the DISPLAY in the MONITOR (BLANK SIGNAL)
OSD-R	The LCD/Viwe the RED signal which becomes the DISPLAY in the Finder
OSD-G	The LCD/Viwe the GREEN signal which becomes the DISPLAY in the Finder
OSD-B	The LCD/Viwe the BLUE signal which becomes the DISPLAY in the Finder
OSD-BLANK	The LCD/Viwe outline letter signal (BLANK SIGNAL) of EDGE portion of the letter which becomes the DISPLAY in the Finder

The OSD it operates a circuit

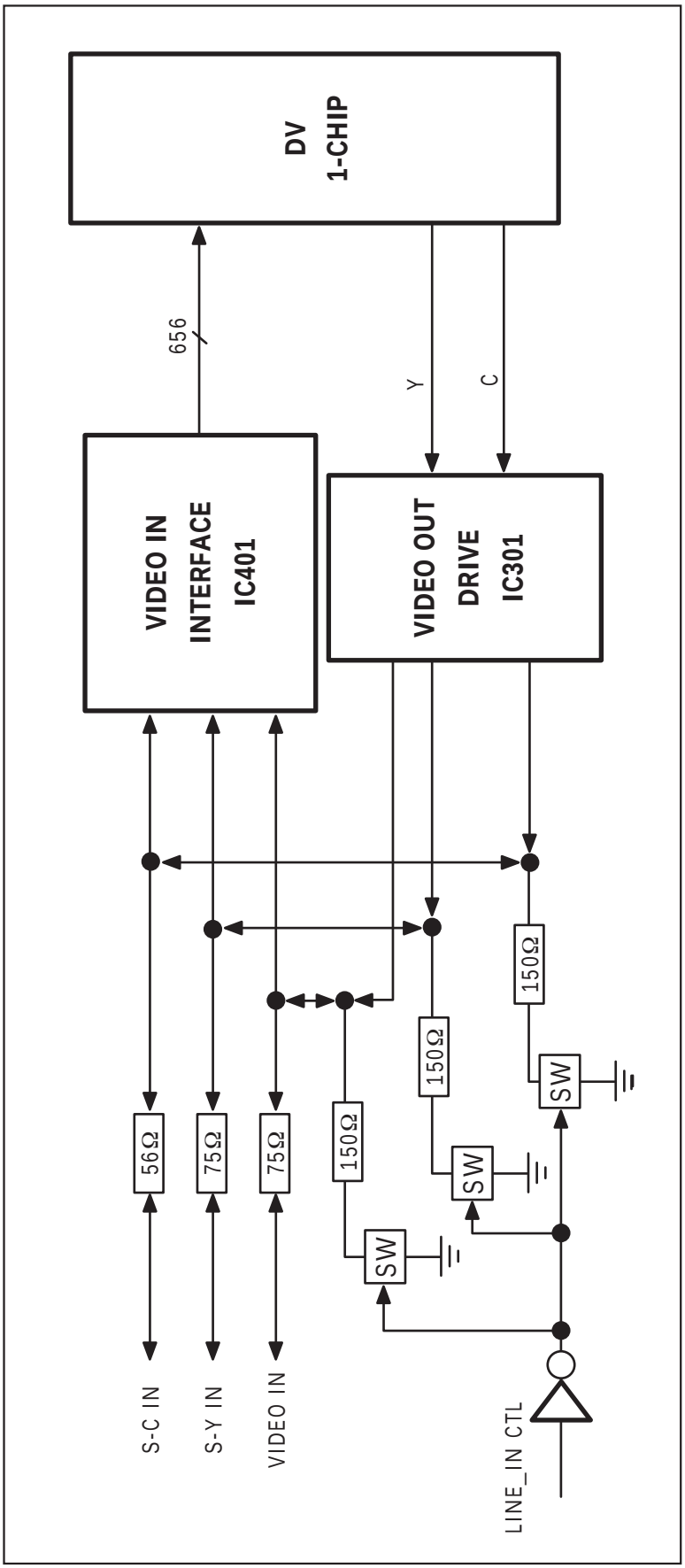
By the H/V-SYNC the location of letter of the Monitor and the LCD being decided, by the SERIAL DATA of MAIN MICOM are stored in CHARACTOR GENERATOR letter and the DISPLAY.
The DISPLAY type of letter comes to be classified with the letter which becomes the Display in the letter which becomes the Display in the Monitor and the LCD and View Finder to the Monitor it is indicated with the B/W and to LCD/View Finder the Display it is done with the Color and and.
Also the Date/Time to be recorded, to come, always in the Tape the signal which is recorded comes to be indicated by Date/Time on/dff the Monitor or in the LCD and Viwe Finder.

(1) VOB/VOW Signal

The CHARACTOR the signal which is output from the GENERATOR with VIDEO OUTPUT DRIVE IC being input the Mix and and with the Monitor, signal it becomes VIDEO signal and the Switching and it becomes it is output.

(2) OSD-R/G/B/BLANK Signal

The CHARACTOR the signal which is output from the GENERATOR does the DV 1Chip from Y/U/V signal and the LCD DRIVE IC which are output or from CVF DRIVE IC the MIX with each other and in LCD/View Finder PANEL the DISPLAY it is done and and.



LINE IN CONTROL	FUNCTION
L	OUTPUT MODE(VIDEO/S-VIDEO)
H	External LINE input (VIDEO/S-VIDEO)

Fig. 6-11

6-7-4 AV IN OUT Switching CIRCUIT

AV operation of IN circuit
The AV the IN becomes accomplished by DECORDER (IC401).
The VIDEO signal which is input depends to a SWITCHING circuit and the blood ten su becomes the MATCHING and it is input it comes with the IC401 and and to be changed with 656 DATA FORMAT.
The signal which is changed a LINE IN operation and and is input with the IC201 and it is accomplished.

The LINE the IN the input of COMPOSITE signal and S-VIDEO signal all is possible and by the menu the selection becomes accomplished.

Operational essential condition of IC401

<Table 6-8>

CTL PIN discription	FUNCTION
32	The CLOCK it decides with standard signal and the position CLOCK signal must be input
40	The LINE in order to accomplish a IN operation, with the signal from LINE IN MODE being maintained certainly with the HIGH, must maintain the LOW from mode other than the that
23, 24	The DECORDER it accomplishes an operation to give the order for, it decides with the place which it receives the IN/OUT position DATA must come to accomplish.

6-7-5 DVC TAPE PATTERN FORMAT

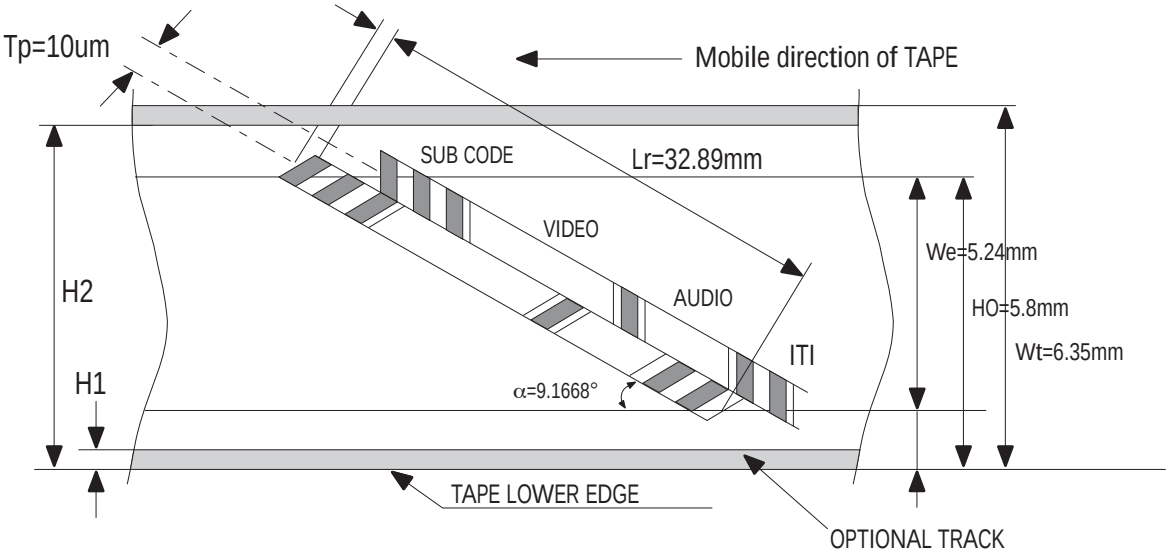


Fig. 6-12 DVC PATTRN FORMAT

SECTOR ARRANGEMENT ON HELICAL TRACK

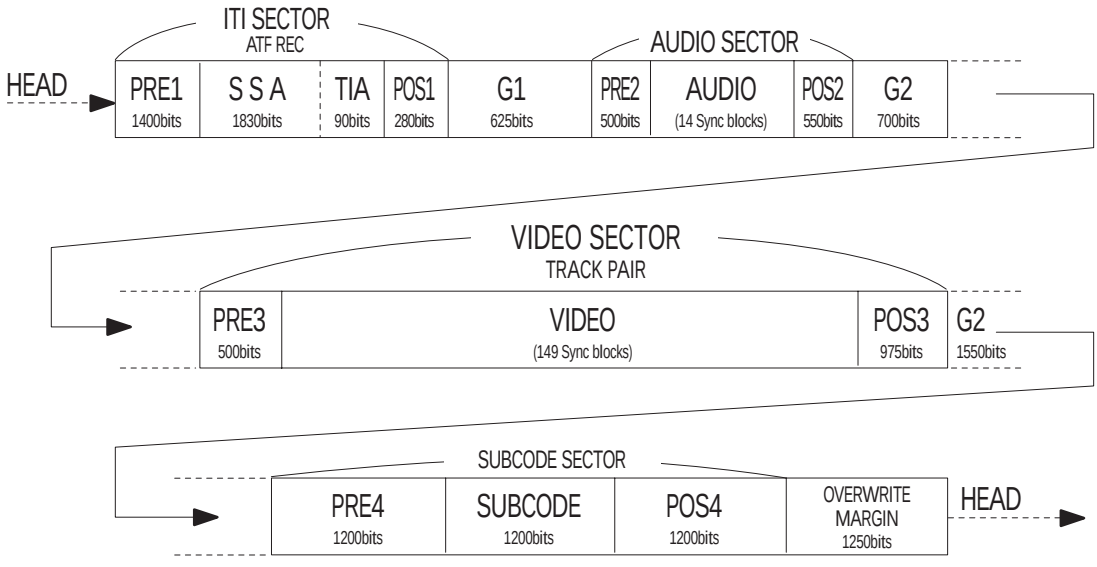


Fig. 6-13

6-7-6 ITU-R656(4:2:2)SAMPLING structure

<Table 6-9>

NO	ITEM		525/60 system	625/50 system
1	SAMPLING frequency Brightness (Y) signal Colour difference (Cr and Cb) signal		13.5MHz 6.75MHz	
2	Per line total pixel possibility Brightness (Y) signal Colour difference (Cr and Cb) signal		 858 429	 864 432
3	Per LINE ACTIVE PIXEL possibility Brightness (Y) signal Colour difference (Cr and Cb) signal		720 360	
4	Per FRAME ACTIVE LINE possibility		480	576
5	ACTIVE LINE number FIELD1 FIELD2		 23~262 285~524	 23~310 335~622
6	Quentization		The Y, the Cr and the Cb, it was identical, 8bits Quentization	
7	Analog image signal level and Quentization Relationship with the level which becomes	scale level: Y Cr,Cb	1~254 LEVEL 220 : WHITE LEVEL=235 BLACK LEVEL=16 LEVEL 225 : GRAY LEVEL =128	

7. Deck Operating Description

7-1 Nomenclature

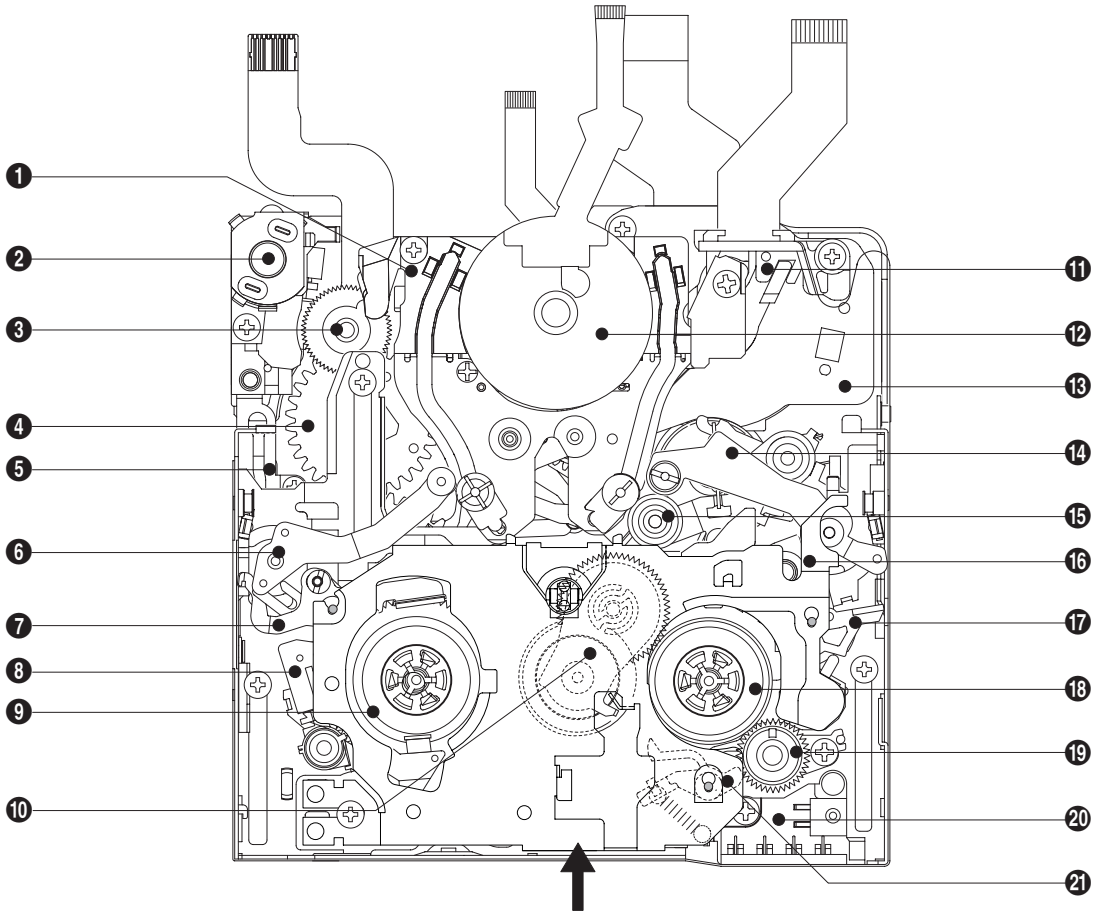


Fig. 7-1 Top View

❶ BASE DRUM	❽ BRAKE S	⓯ ARM PINCH
❷ MOTOR LOADING	❾ REEL DISK S	⓰ COVER REEL
❸ GEAR WHEEL	❿ IDLER	⓱ LEVER EJECT
❹ GEAR MODE SWITCH	⓫ HOLDER FPC SUB	⓲ REEL DISK T
❺ GUIDE TENSION CAM	⓬ DRUM	⓳ BRAKE PULLY
❻ ARM TENSION	⓭ MOTOR CAPSTAN	⓴ SWITCH MIC
❼ BRAKE TENSION	⓮ REVIEW ARM	㉑ BRAKE MAIN T

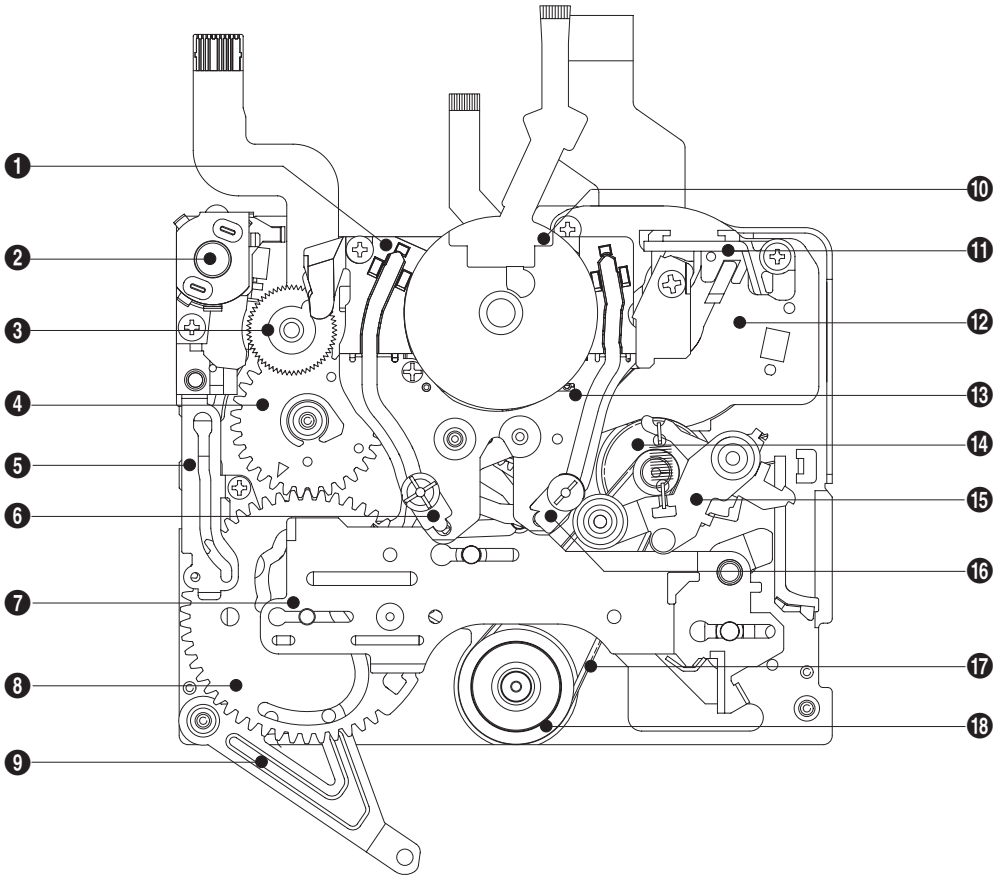


Fig. 7-2 Bottom View

1. BASE DRUM
2. MOTOR LOADING
3. GEAR WHEEL
4. GEAR MODE SWITCH
5. GUIDE TENSION CAM
6. POLE BASE S
7. SLIDE MAIN
8. GEAR CAM MAIN
9. LEVER CAM
10. DRUM
11. HOLDER FPC SUB
12. MOTOR CAPSTAN
13. GUIDE RAIL
14. GEAR CAPSTAN
15. ARM PINCH
16. POLE BASE T
17. TIMMING BELT
18. GEAR PULLY

7-2 Switch Modes

<Table 7-1 Switch Mode Code>

Modes	signal 2+common	Rotation Angle of Gear Mode	Mechanical state
EJECT	18kΩ	-68.5° ~ -46.6°	Open housing
UNLOAD	36	-4° ~ 4°	Standby Cassette down
LD 1	54	51° ~ 59°	Idler Rotate and stop in loading mode
LD 2	72	70° ~ 140.8°	Capstan Rotate in unload mode
STOP	90	199.89° ~ 207.85°	stop
PLAY	0	269.3° ~ 288.5°	In REC/PB/CUE/FF/PAUSE

* Fig is based Eject Mode.

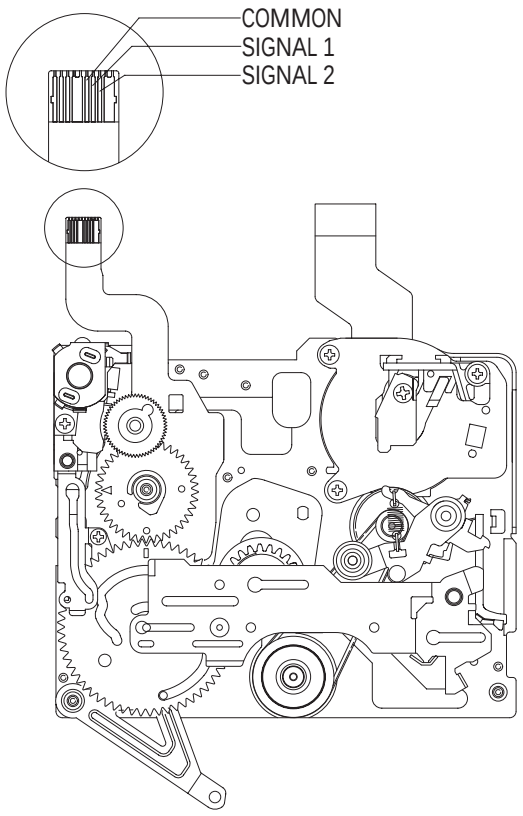


Fig. 7-3

7-3 Operation

7-3-1 Gear Train

1) Moter Loading ❶ rotates.
   (Gear Worm Motor ❷ → Gear Worm Loading ❸)
2) Gear Wheel ❹ rotates.
3) Gear Mode Switch ❺ rotates.
4) Gear Cam Main ❻ rotates.

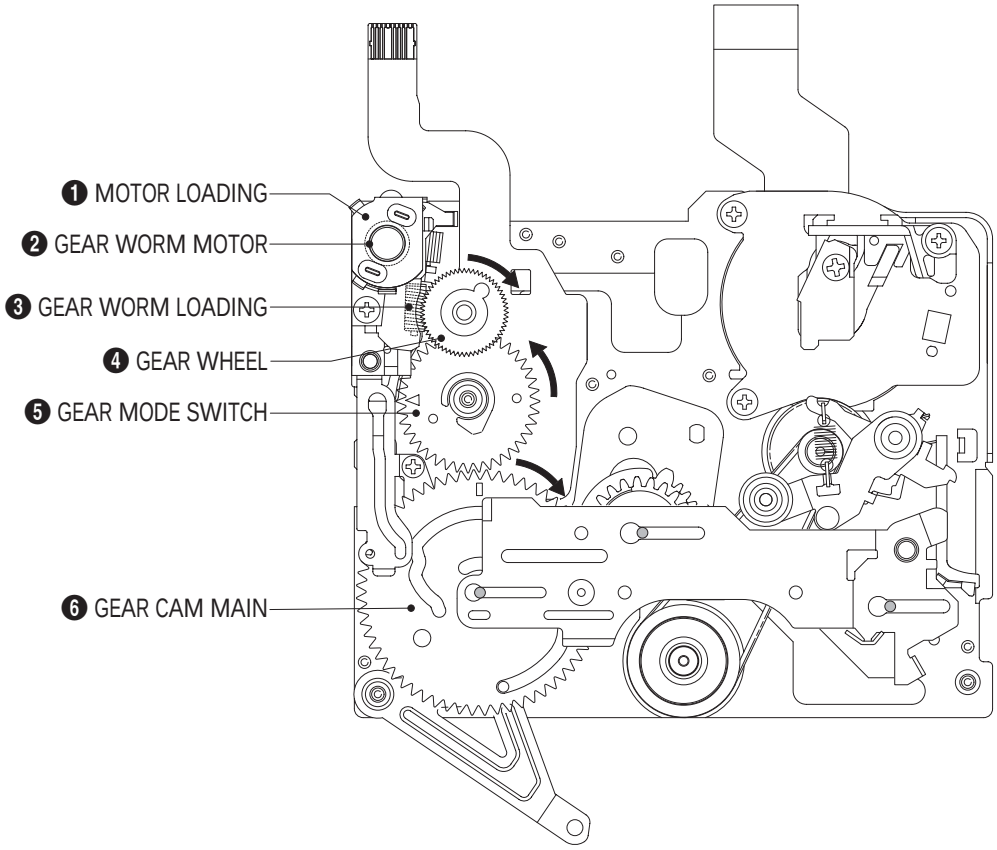


Fig. 7-4

7-3-2 Chassis Sub

1) Motor Loading ❶ rotates.
2) Gear Wheel ❷ rotates.
3) Gear Mode Switch ❸ rotates.
4) Gear Cam Main ❹ rotates.
5) Lever Cam ❺ rotates.
6) Chassis Sub ❻ moves.

Mode	Chassis Sub
	OFF ON
EJECT	
UNLOAD	
LD 1	
LD 2	
STOP	
PLAY	

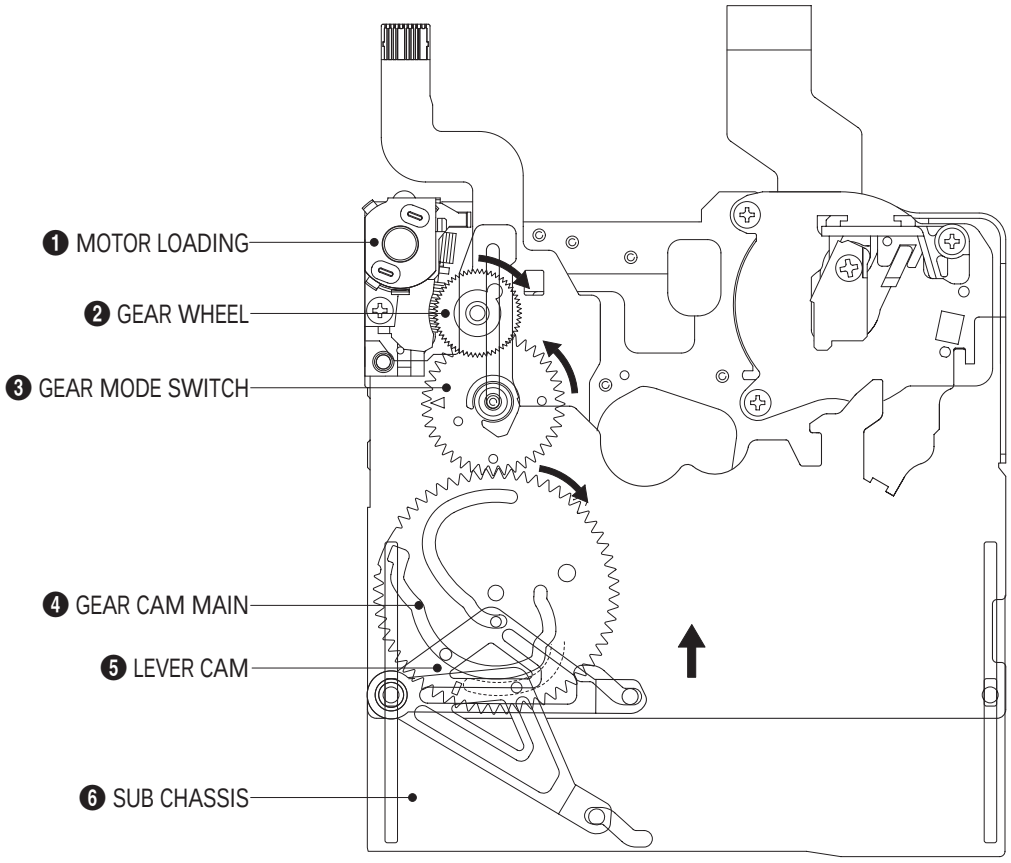


Fig. 7-5

7-3-3 Brake S (SUB/MAIN)

1) Motor Loading ❶ rotates.
2) Chassis Sub ❷ slides.
3) Slide Main ❸ slides in direction of arrow.
4) Brakes S ❹ released or operated to Reel Disk S ❺ by slide Main ❸.

Mode	Sub Brake	Main Brake
EJECT	OFF ON	OFF ON
UNLOAD		
LD 1		
LD 2		
STOP		
PB		

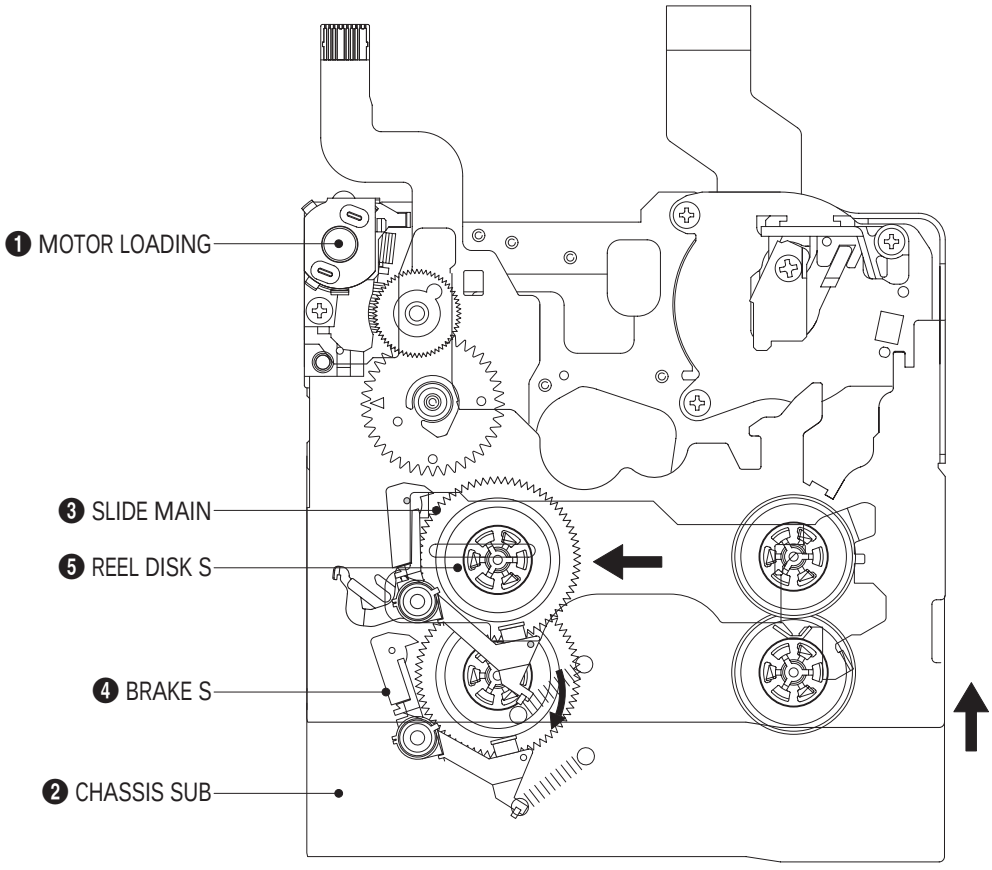


Fig. 7-6

7-3-4 Brake T

1) Motor Loading ❶ rotates.
2) Chassis Sub ❷ slides.
3) Slide Main ❸ slides in direction of arrow.
4) Brake T ❹ released or operated to Reel disk T ❺ by slide Main ❸.

Mode	Brake Main T
	OFF ON
EJECT	
UNLOAD	
LD 1	
LD 2	
STOP	
PB	

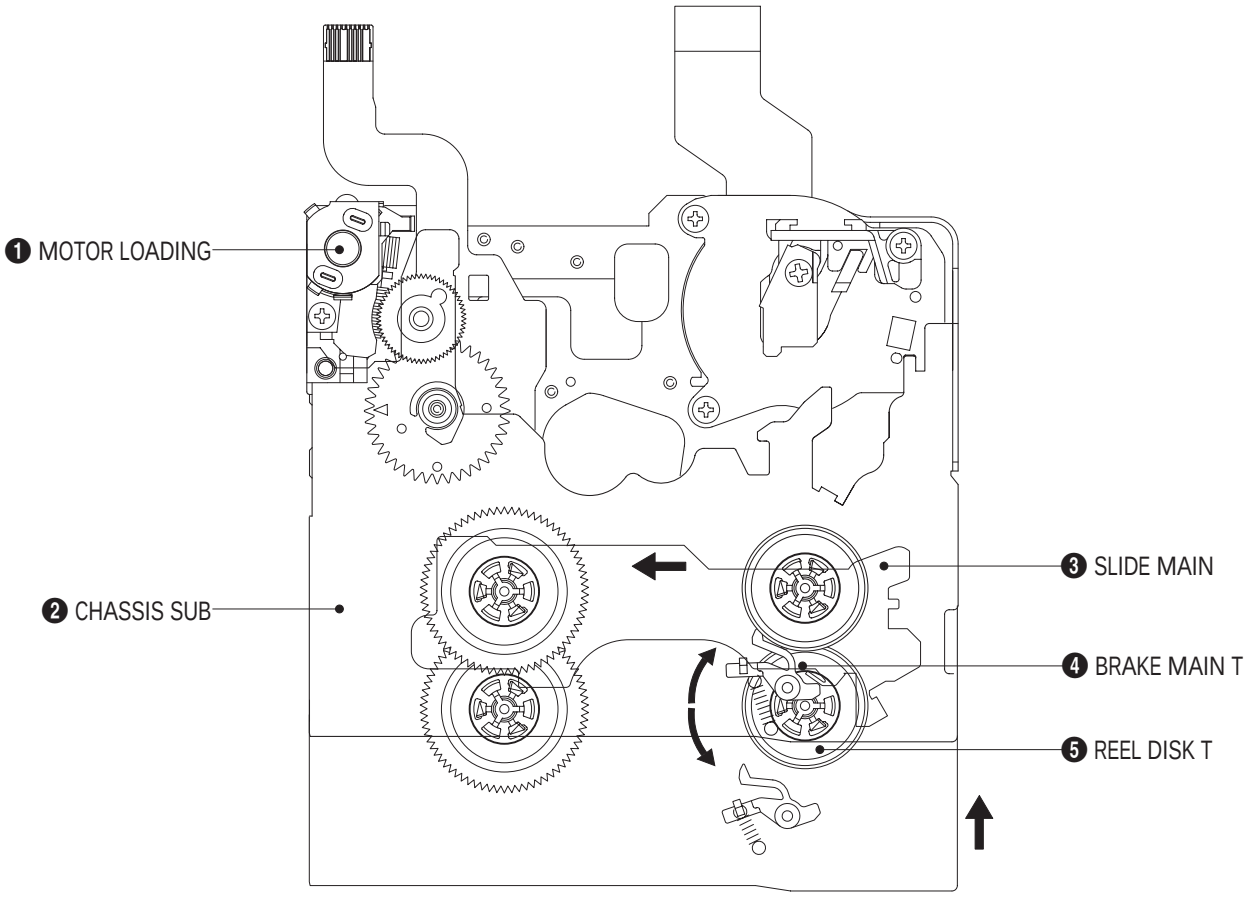


Fig. 7-7

7-3-5 Arm Tension

1) Motor Loading ❶ rotates.
2) Chassis Sub ❷ slides.
3) Arm Tension ❻ slides in direction of arrow by Guide tension cam ❸ and cam curve A ❹.
4) Brake tension ❼ released or operated connection with Arm Tension.
5) After Loading finished, Arm Tension ❻ is controled by cam curve ❾ of Gear Mode Switch ❽.

Mode	Arm Tension
	OFF ON
EJECT	
UNLOAD	
LD 1	
LD 2	
STOP	
PLAY	

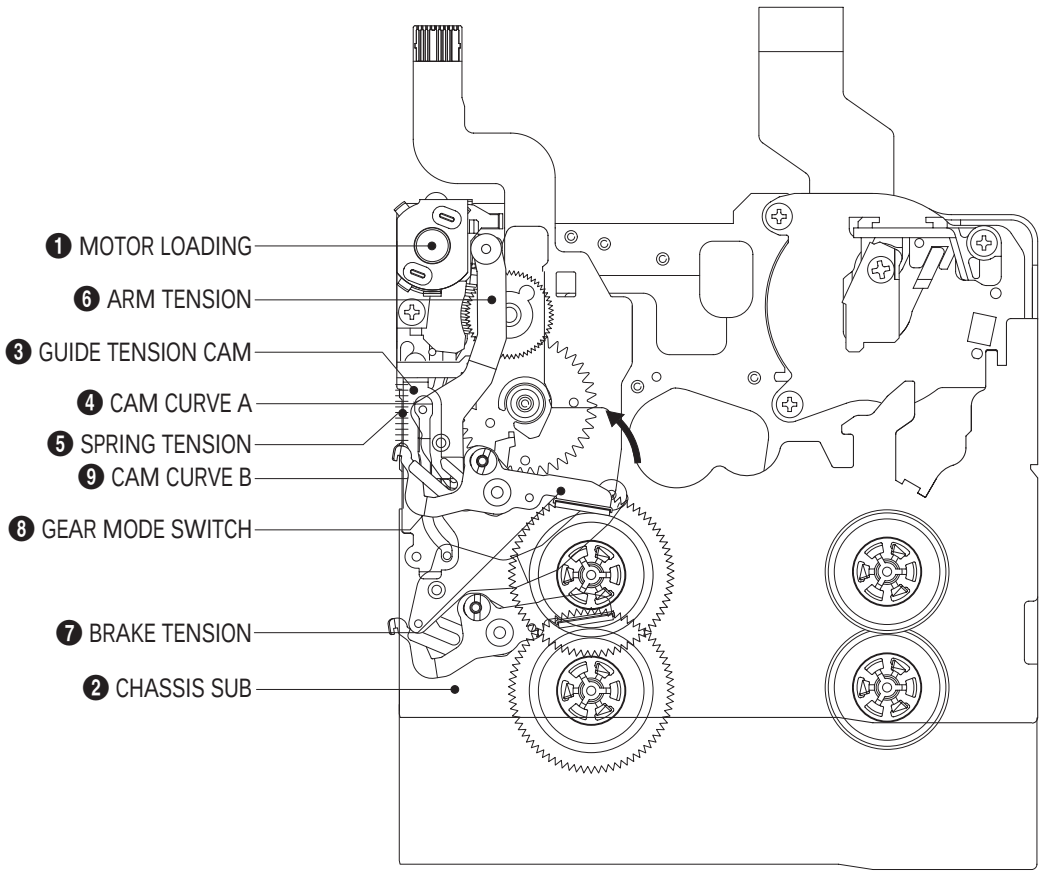


Fig. 7-8

7-3-6 Arm Pinch

1) Motor Loading ❶ rotates.
2) Chassis Sub ❷ moves.
3) Arm Pinch ❹ rotates cam curve A ❸ of Chassis Sub ❷.
4) After Chassis Sub ❷ is finished loading, slider main ❺ slides in direction of arrow.
5) Pinch Roller ❻ contacts shaft of Motor capstan ❼.
6) Motor loading ❶ rotates in reverse.
7) Slide main ❺ moves in reverse direction of arrow.
8) Pinch Roller ❻ released from shaft of Motor Capstan ❼ by spring force of spring Lever pinch ❽.

Mode	Arm Pinch
	OFF ON
EJECT	
UNLOAD	
LD 1	
LD 2	
STOP	
PLAY	

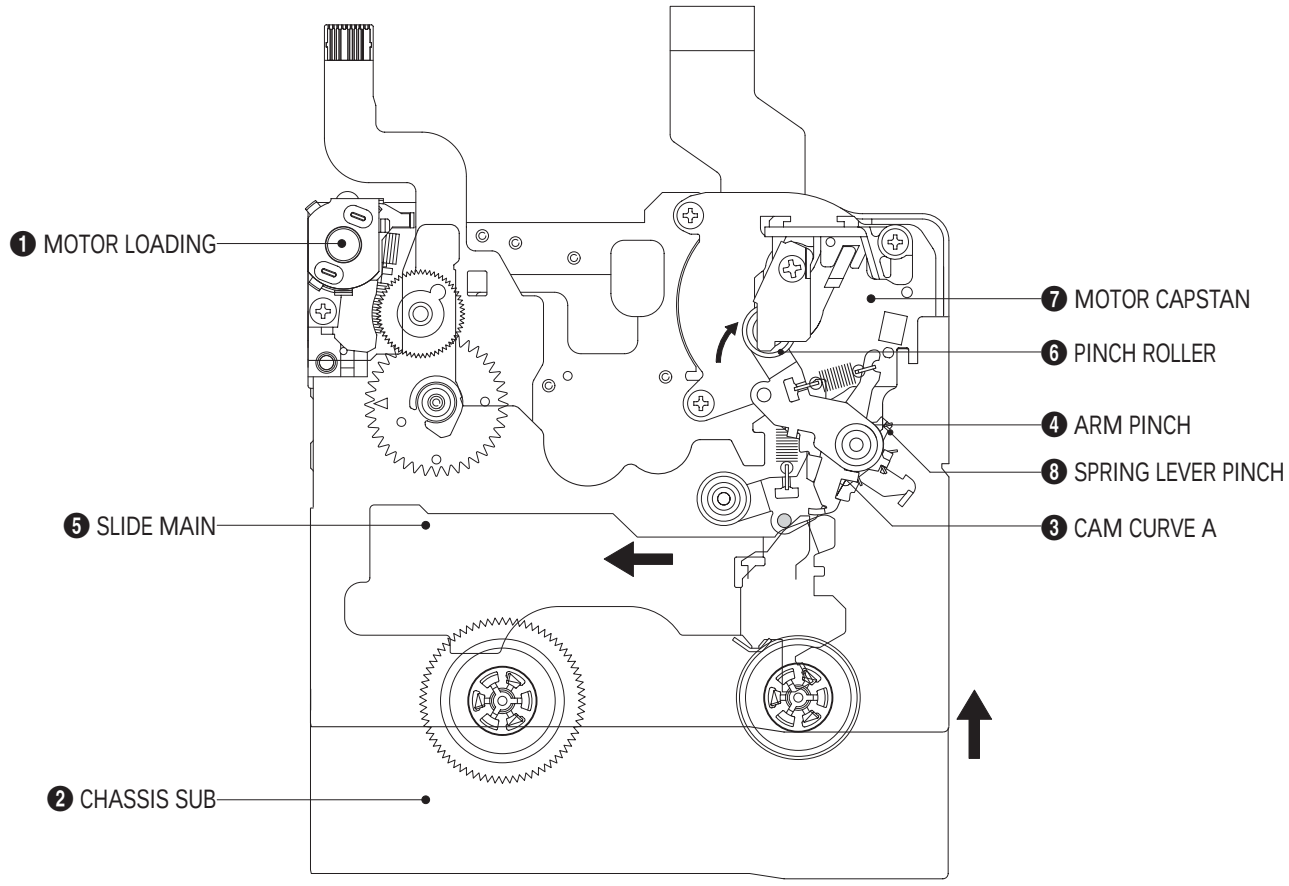


Fig. 7-9

7-3-7 Arm Review

1) Motor Loading ❶ rotates.
2) Chassis Sub ❷ moves.
3) Arm Review ❺ simultaneously rotates clockwise and translates via cam curve ❹ of Chassis Main ❸.

Mode	Arm Review
	OFF ON
EJECT	
UNLOAD	
LD 1	
LD 2	
STOP	
PLAY	

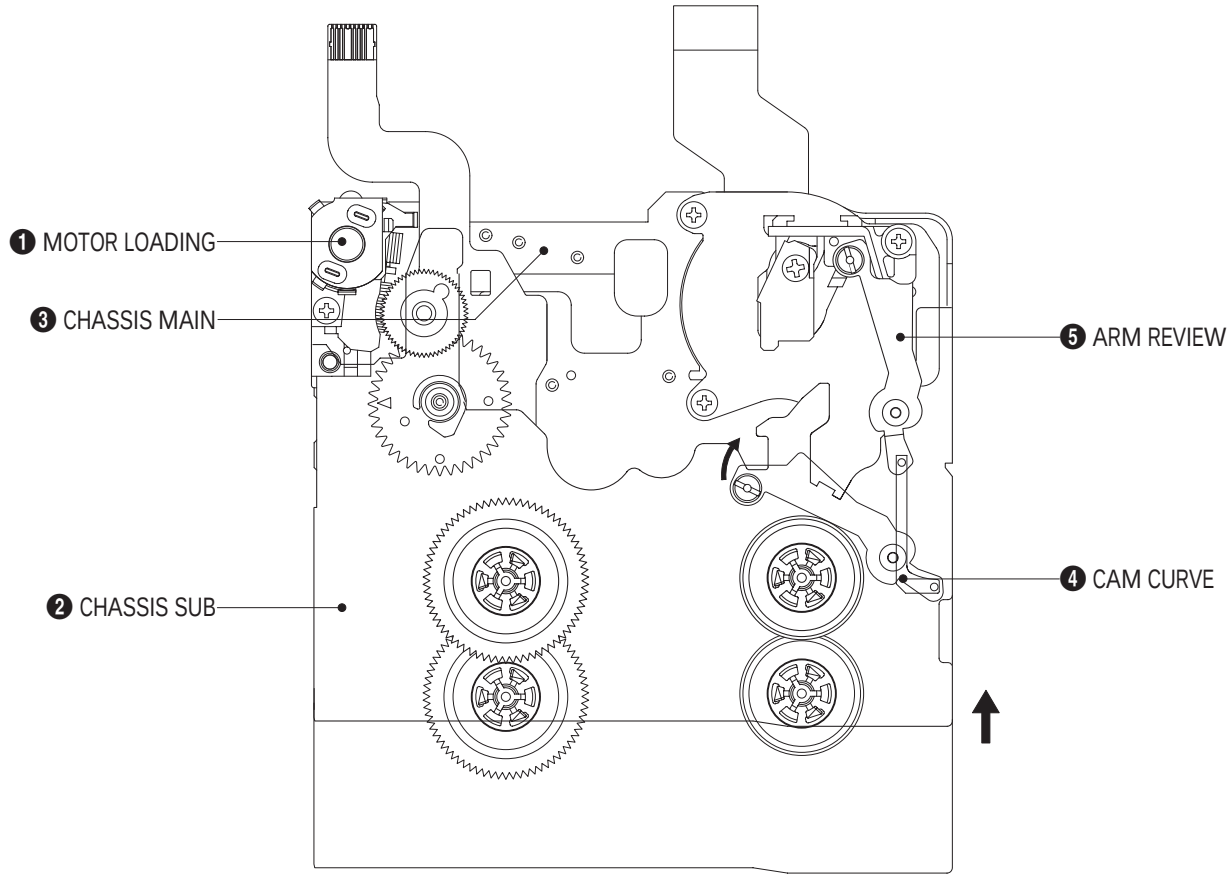


Fig. 7-10

7-3-8 Pole Base S, T

1) Motor Loading ❶ rotates.
2) Gear Wheel ❷ rotates.
3) Gear Mode Switch ❸ rotates.
4) Gear Cam Main ❹ rotates.
5) Gear connector ❺ rotates.
6) Arm Loading S and T are actuated by Gear Loading S ❻ and T ❼.
7) Pole Base S ❽ and T ❾ slide along S and T rails.
8) Pole Base S ❽ and T ❾ attach to V home of Base Drum ⓫.

Mode	Pole Base S, T
	OFF ON
EJECT	
UNLOAD	
LD 1	
LD 2	
STOP	
PLAY	

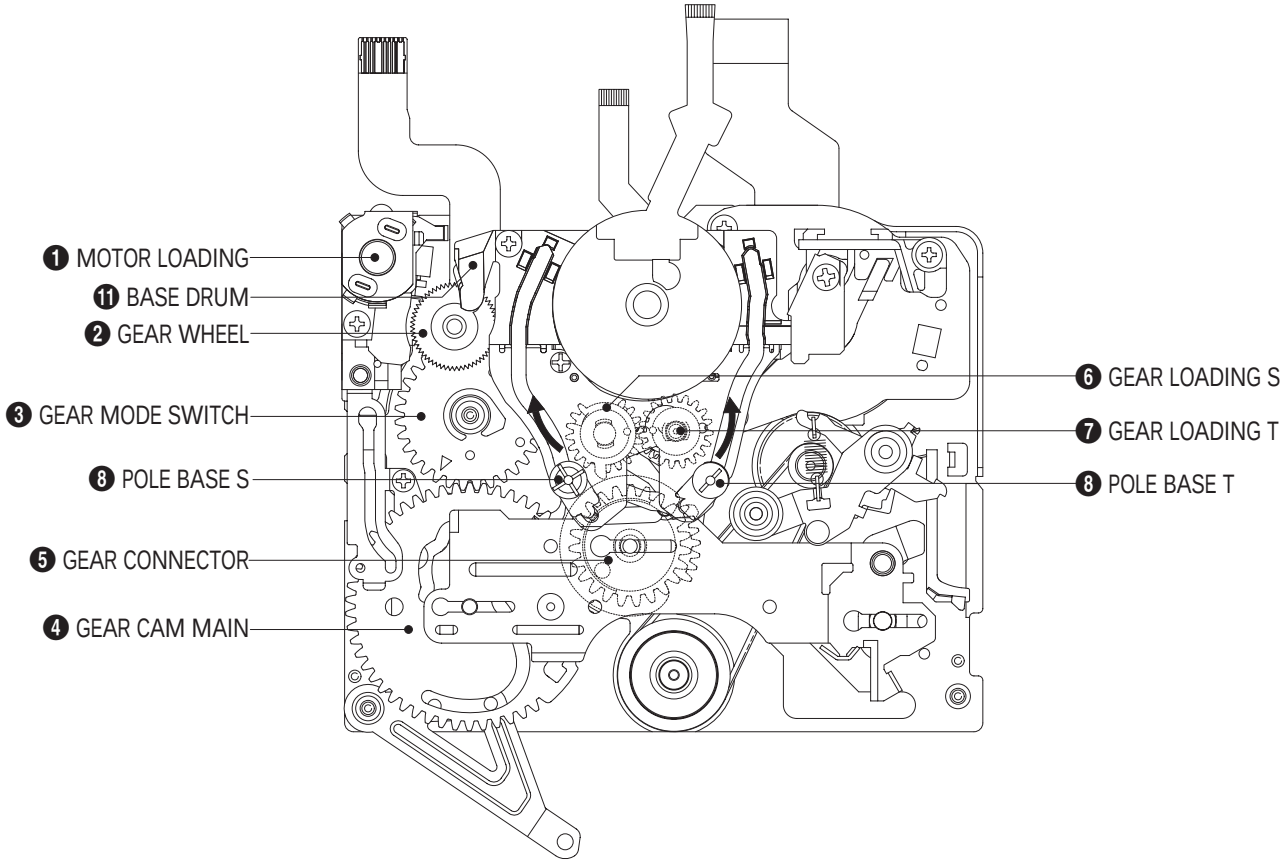


Fig. 7-11

7-3-9 Reel Driving

1) Motor Capstan ❶ rotates.
2) Gear Capstan ❷ rotates.
3) Belt timming ❸ transmits rotation to Gear pully ❹.
4) Gear Idler ❺ engages Reel Disk T ❻ or Reel Disk S ❻.
5) Reel Disk T ❻ or Reel Disk S ❼ rotates.

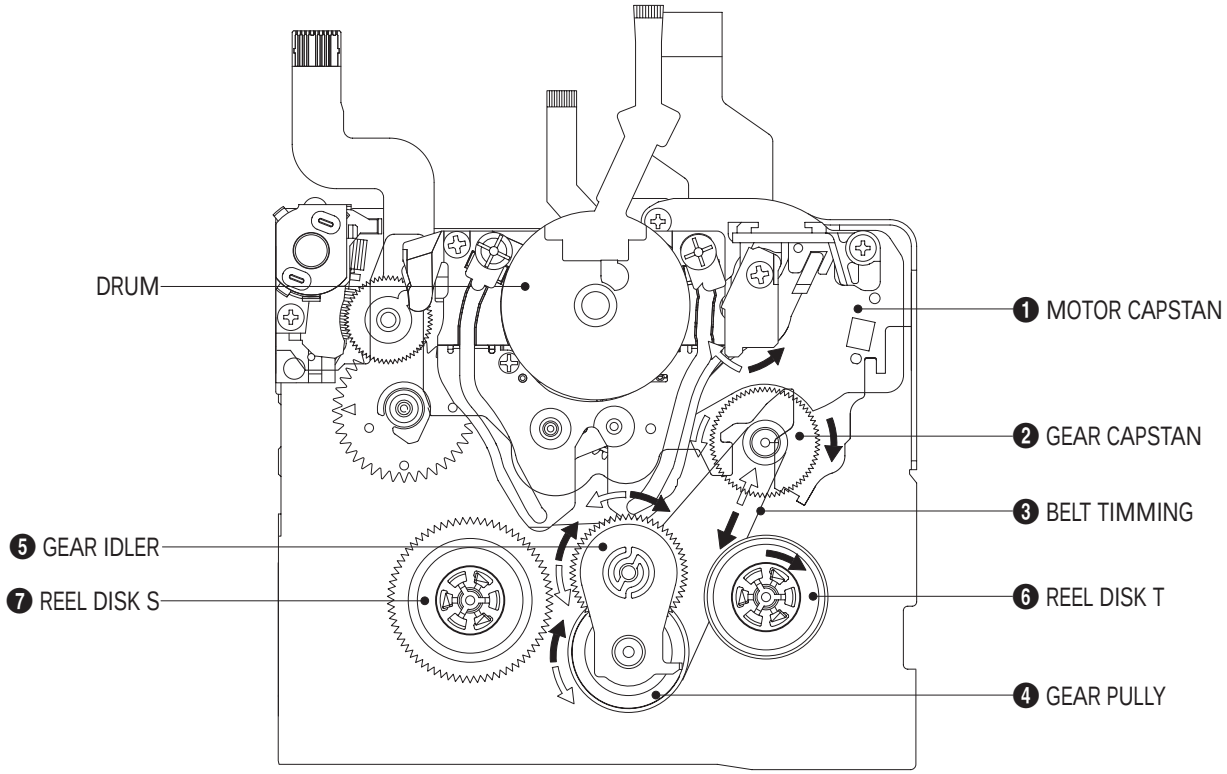
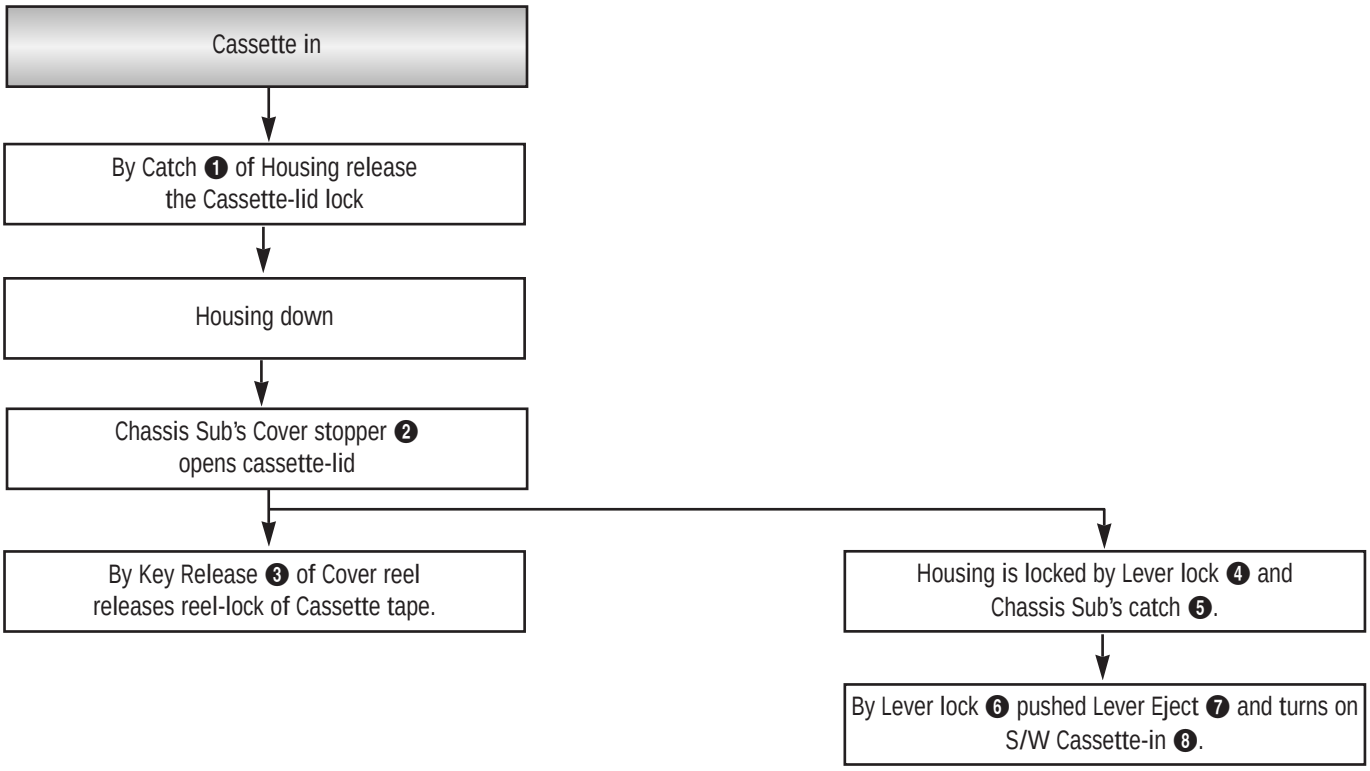


Fig. 7-12

7-4 Mode Transitions

7-4-1 Cassette in → Cassette down


Cassette in
By Catch ❶ of Housing release the Cassette-lid lock
Housing down
Chassis Sub's Cover stopper ❷ opens cassette-lid
By Key Release ❸ of Cover reel releases reel-lock of Cassette tape.
Housing is locked by Lever lock ❹ and Chassis Sub's catch ❺.
By Lever lock ❻ pushed Lever Eject ❼ and turns on S/W Cassette-in ❽.

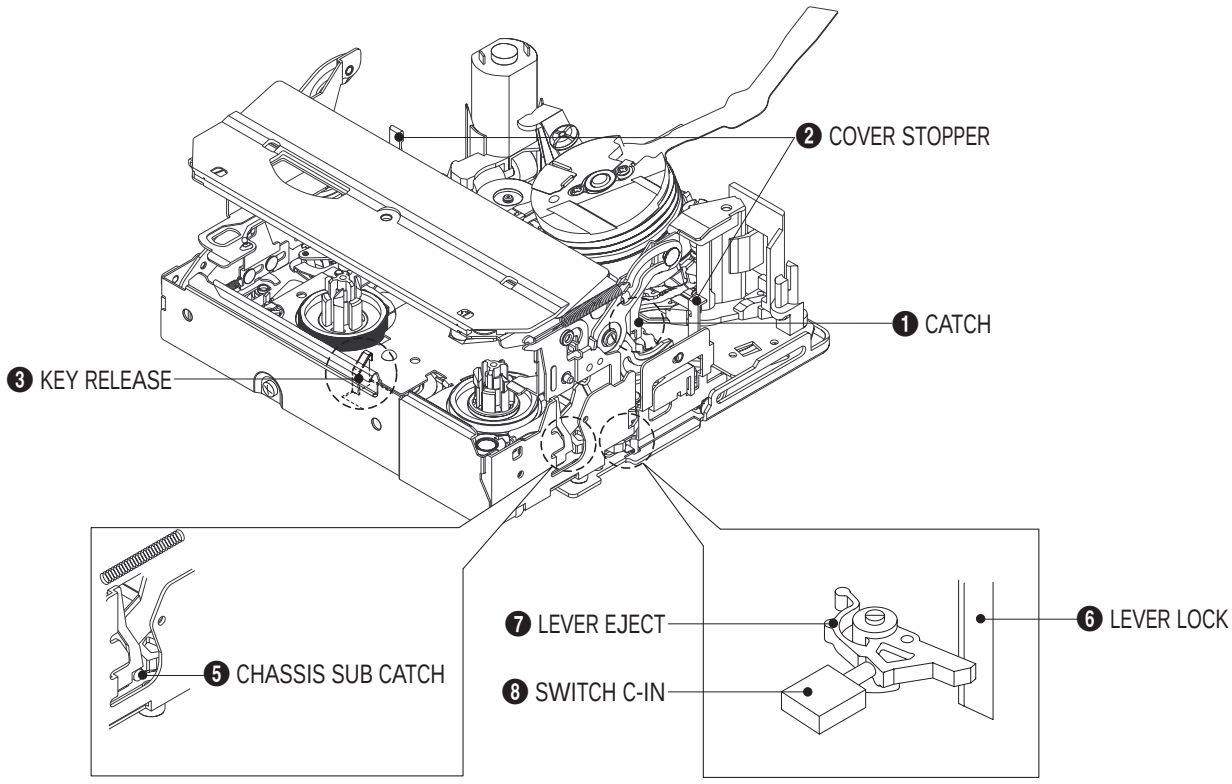
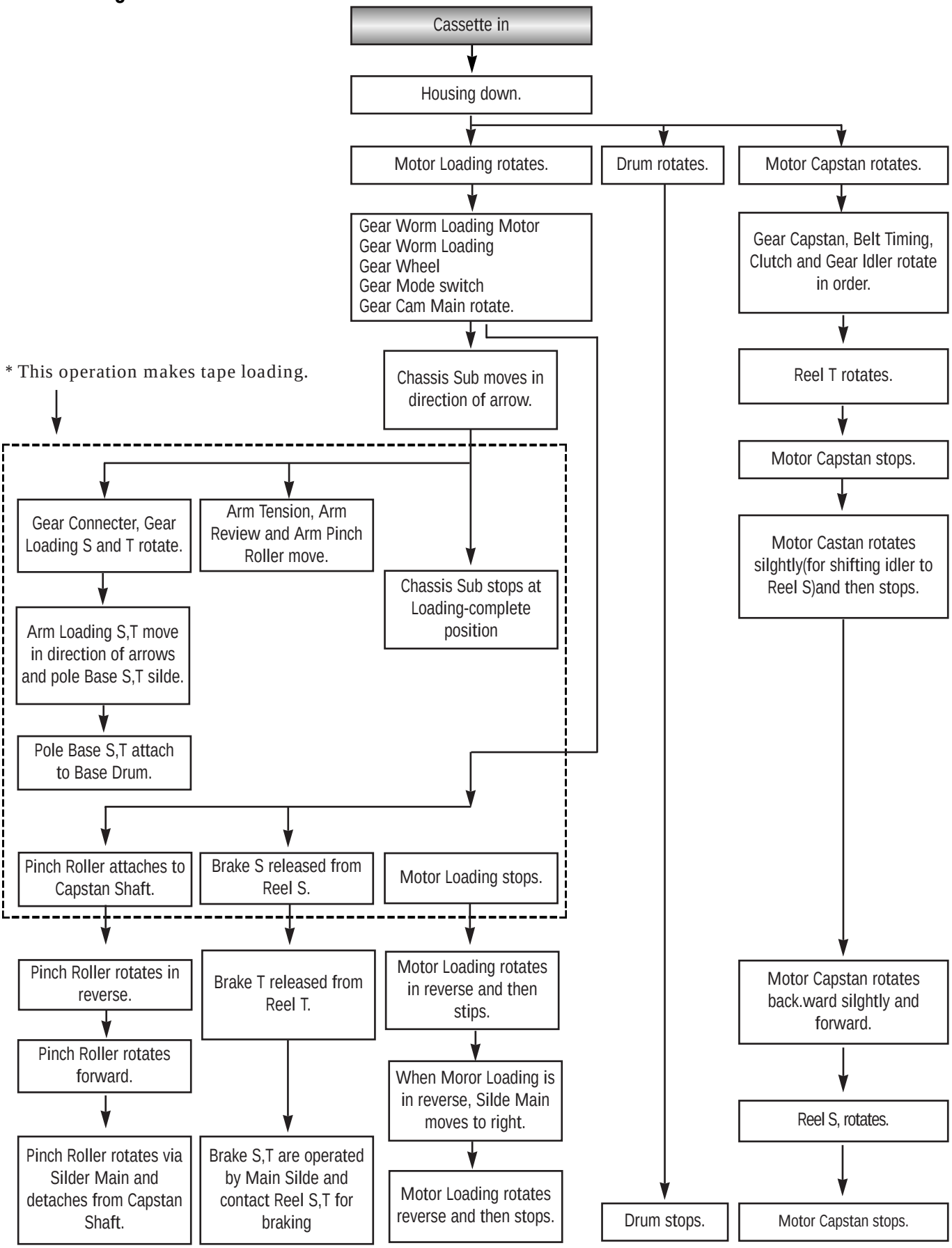


Fig. 7-13

7-4-2 Loading


Cassette in
Housing down.
Motor Loading rotates.
Drum rotates.
Motor Capstan rotates.
Gear Worm Loading Motor
Gear Worm Loading
Gear Wheel
Gear Mode switch
Gear Cam Main rotate.
Gear Capstan, Belt Timing, Clutch and Gear Idler rotate in order.
* This operation makes tape loading.
Chassis Sub moves in direction of arrow.
Reel T rotates.
Motor Capstan stops.
Gear Connecter, Gear Loading S and T rotate.
Arm Tension, Arm Review and Arm Pinch Roller move.
Chassis Sub stops at Loading-complete position
Motor Castan rotates silghtly(for shifting idler to Reel S)and then stops.
Arm Loading S,T move in direction of arrows and pole Base S,T silde.
Pole Base S,T attach to Base Drum.
Pinch Roller attaches to Capstan Shaft.
Brake S released from Reel S.
Motor Loading stops.
Pinch Roller rotates in reverse.
Brake T released from Reel T.
Motor Loading rotates in reverse and then stips.
Motor Capstan rotates back.ward silghtly and forward.
Pinch Roller rotates forward.
When Moror Loading is in reverse, Silde Main moves to right.
Reel S, rotates.
Pinch Roller rotates via Silder Main and detaches from Capstan Shaft.
Brake S,T are operated by Main Silde and contact Reel S,T for braking
Motor Loading rotates reverse and then stops.
Drum stops.
Motor Capstan stops.

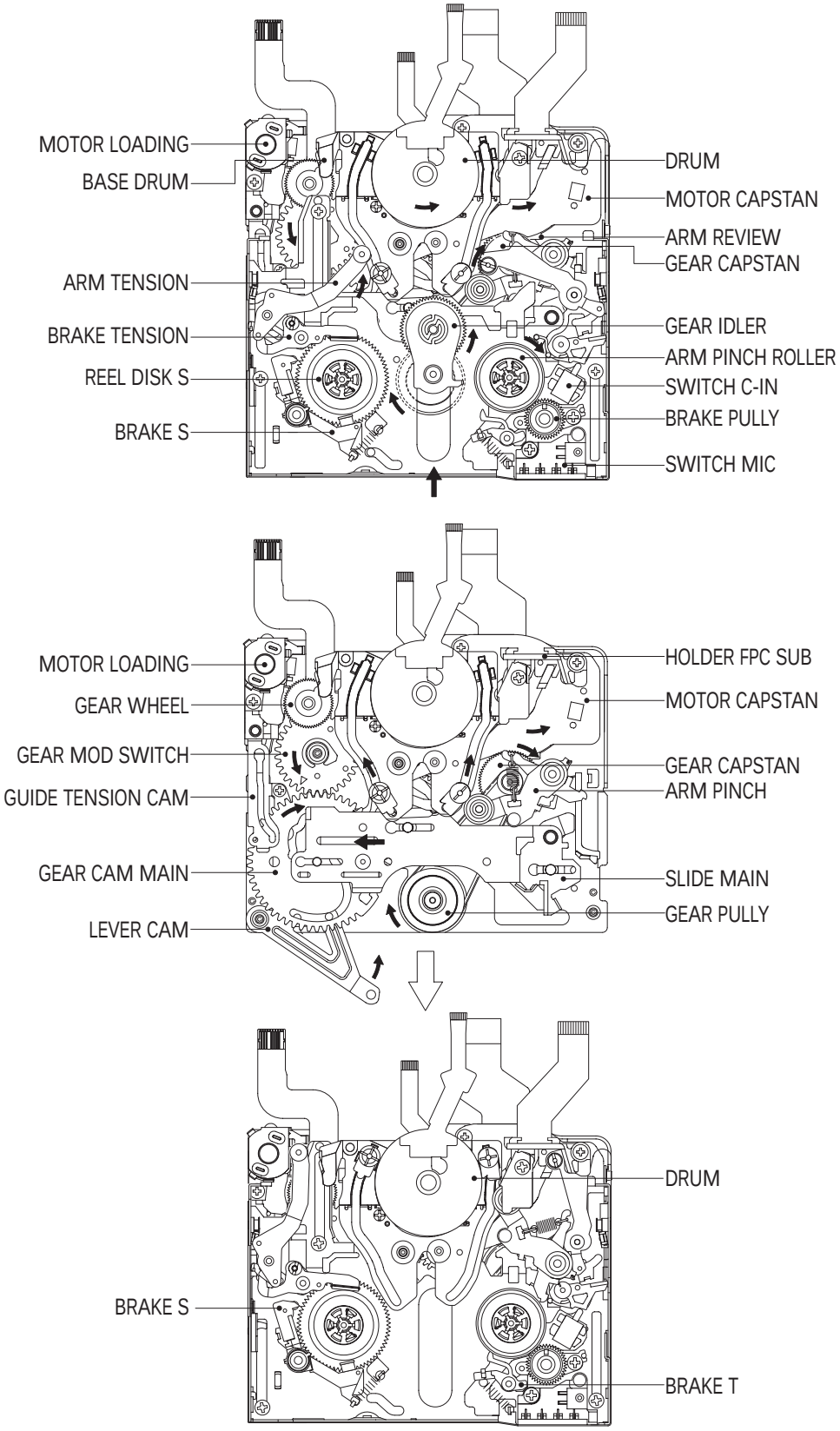
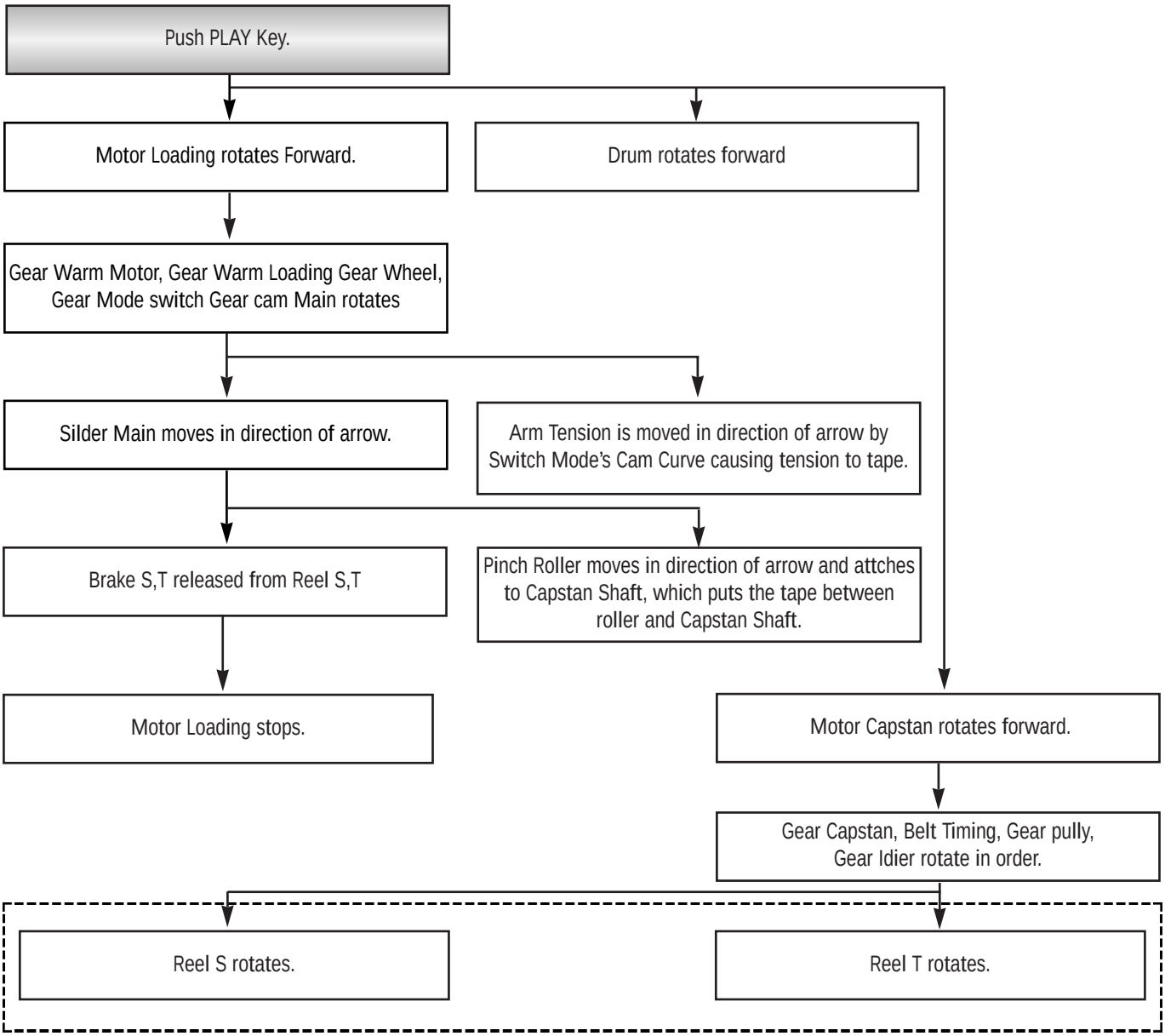

MOTOR LOADING
BASE DRUM
ARM TENSION
BRAKE TENSION
REEL DISK S
BRAKE S
DRUM
MOTOR CAPSTAN
ARM REVIEW
GEAR CAPSTAN
GEAR IDLER
ARM PINCH ROLLER
SWITCH C-IN
BRAKE PULLY
SWITCH MIC
MOTOR LOADING
GEAR WHEEL
GEAR MOD SWITCH
GUIDE TENSION CAM
GEAR CAM MAIN
LEVER CAM
HOLDER FPC SUB
MOTOR CAPSTAN
GEAR CAPSTAN
ARM PINCH
SLIDE MAIN
GEAR PULLY
BRAKE S
DRUM
BRAKE T

Fig. 7-14

7-4-3 Stop → Play


Push PLAY Key.
Motor Loading rotates Forward.
Drum rotates forward
Gear Warm Motor, Gear Warm Loading Gear Wheel, Gear Mode switch Gear cam Main rotates
Silder Main moves in direction of arrow.
Arm Tension is moved in direction of arrow by Switch Mode's Cam Curve causing tension to tape.
Brake S,T released from Reel S,T
Pinch Roller moves in direction of arrow and attches to Capstan Shaft, which puts the tape between roller and Capstan Shaft.
Motor Loading stops.
Motor Capstan rotates forward.
Gear Capstan, Belt Timing, Gear pully, Gear Idier rotate in order.
Reel S rotates.
Reel T rotates.

* Tape is fed by the winding operation of Motor Capstan.

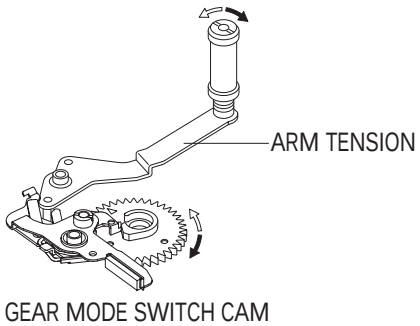


Fig. 7-15

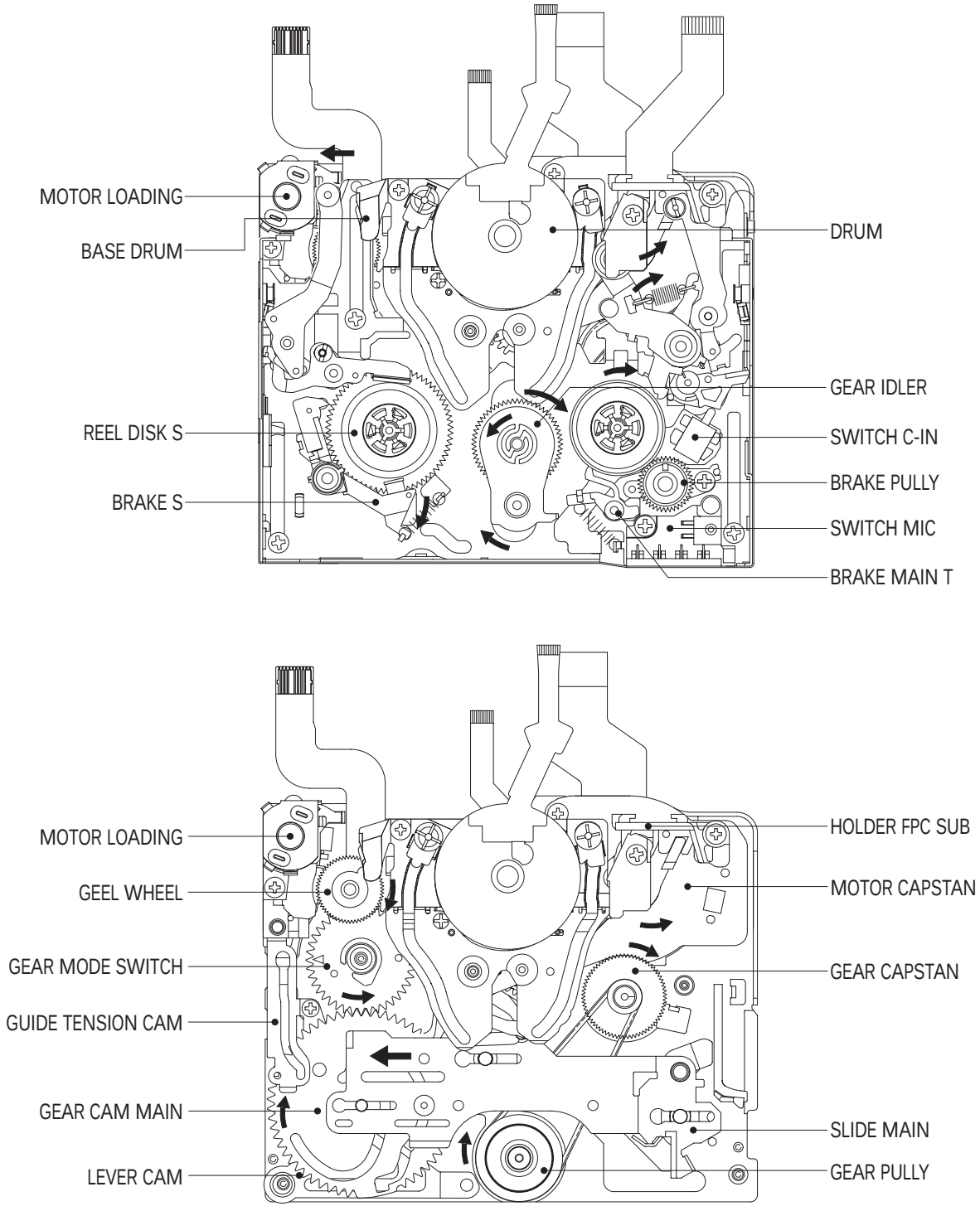
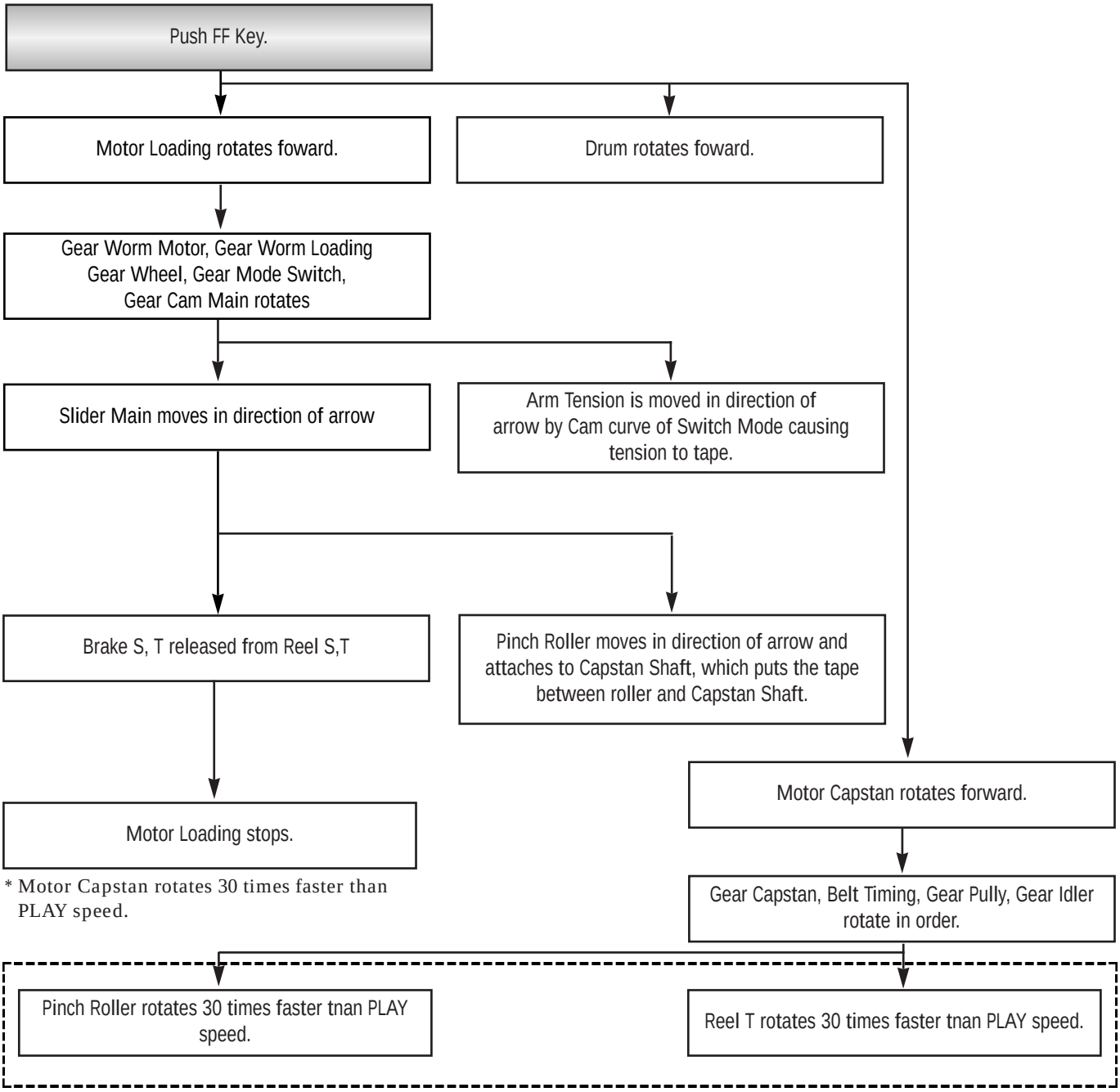

MOTOR LOADING
BASE DRUM
REEL DISK S
BRAKE S
DRUM
GEAR IDLER
SWITCH C-IN
BRAKE PULLY
SWITCH MIC
BRAKE MAIN T
MOTOR LOADING
GEEL WHEEL
GEAR MODE SWITCH
GUIDE TENSION CAM
GEAR CAM MAIN
LEVER CAM
HOLDER FPC SUB
MOTOR CAPSTAN
GEAR CAPSTAN
SLIDE MAIN
GEAR PULLY

Fig. 7-16

7-4-4 Stop → FF


Push FF Key.
Motor Loading rotates foward.
Drum rotates foward.
Gear Worm Motor, Gear Worm Loading Gear Wheel, Gear Mode Switch, Gear Cam Main rotates
Slider Main moves in direction of arrow
Arm Tension is moved in direction of arrow by Cam curve of Switch Mode causing tension to tape.
Brake S, T released from Reel S,T
Pinch Roller moves in direction of arrow and attaches to Capstan Shaft, which puts the tape between roller and Capstan Shaft.
Motor Capstan rotates forward.
Motor Loading stops.
* Motor Capstan rotates 30 times faster than PLAY speed.
Gear Capstan, Belt Timing, Gear Pully, Gear Idler rotate in order.
Pinch Roller rotates 30 times faster tnan PLAY speed.
Reel T rotates 30 times faster tnan PLAY speed.

* This operation feeds tape 30 times faster than PLAY speed.

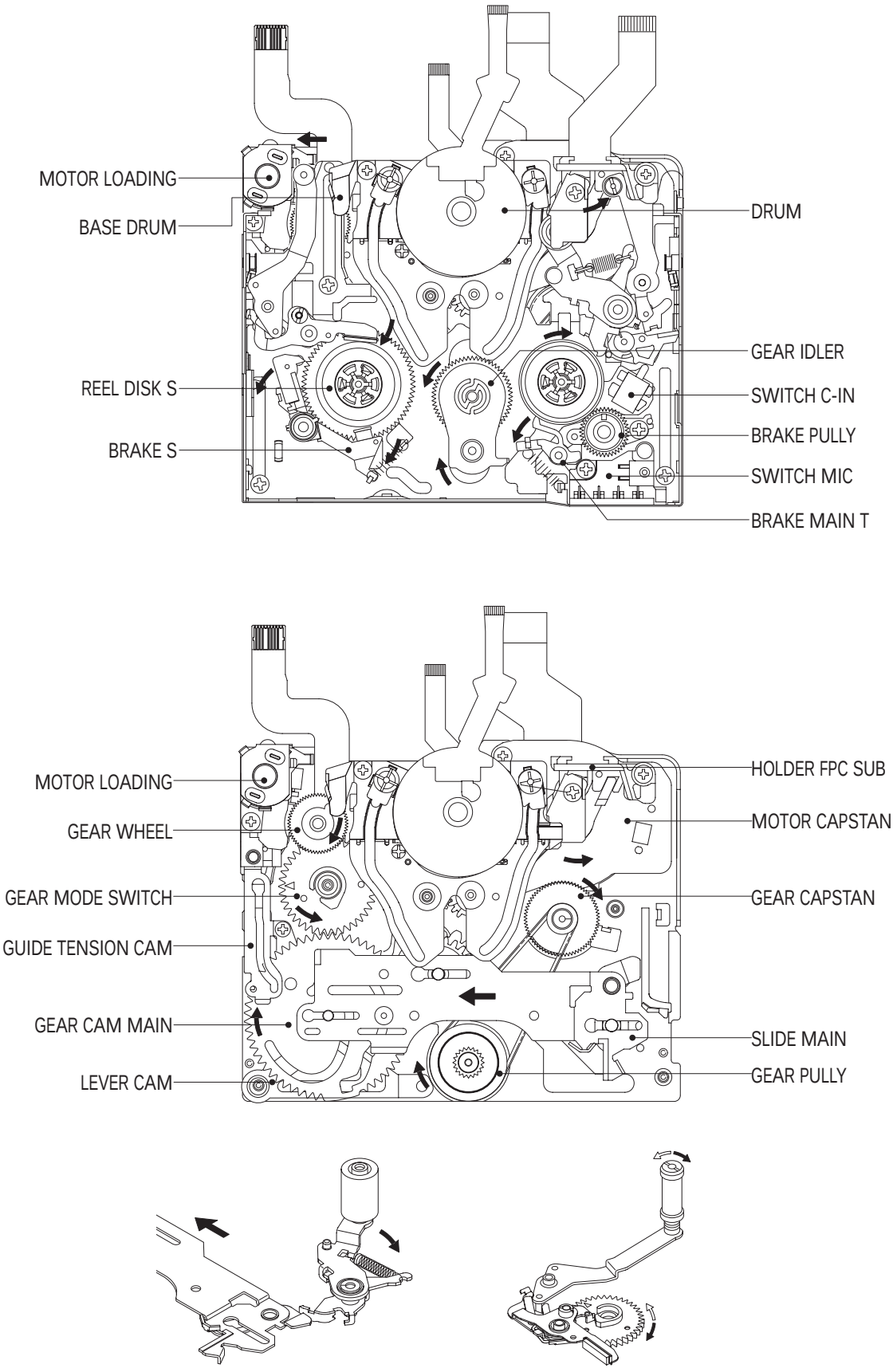
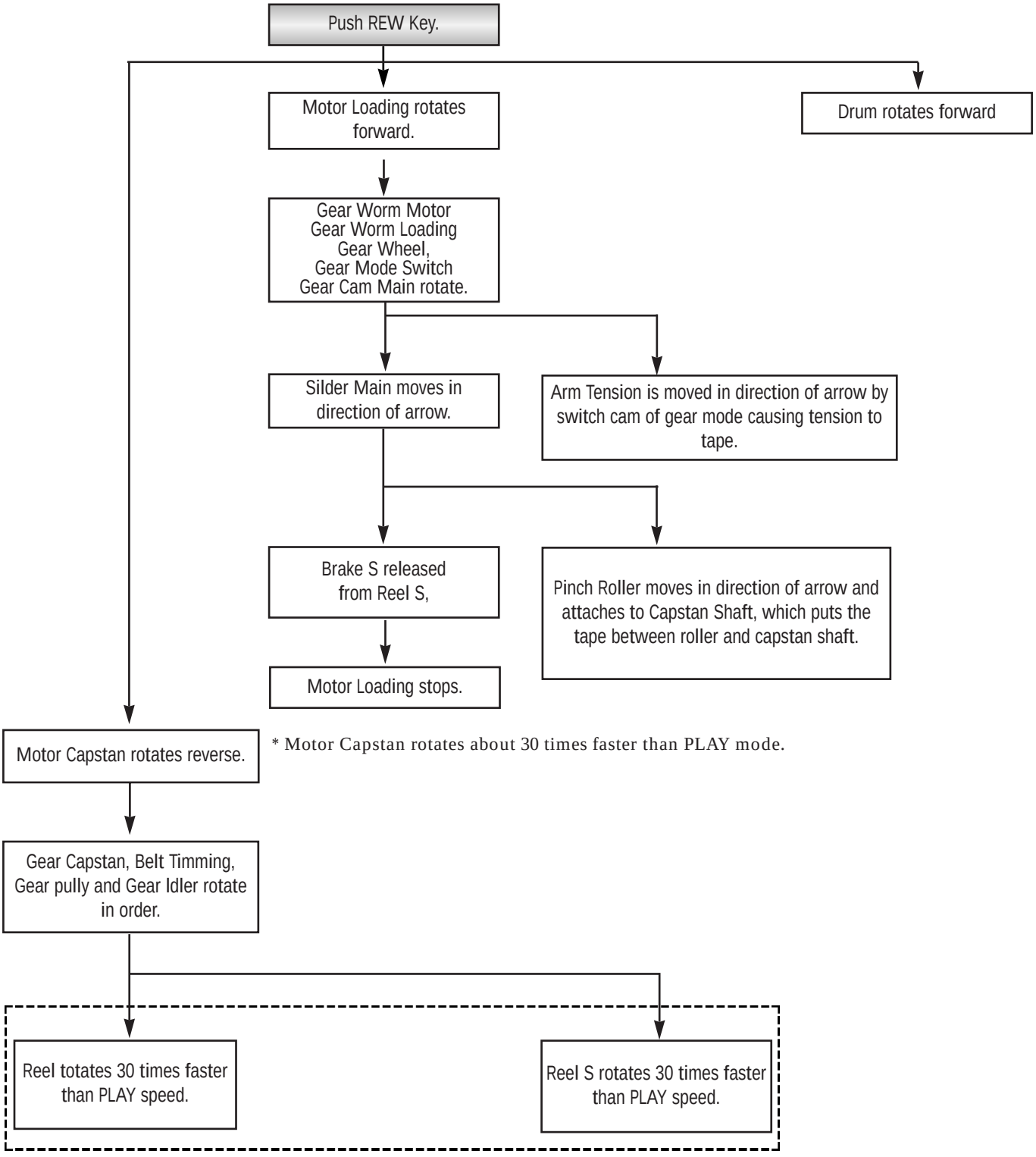

MOTOR LOADING
BASE DRUM
REEL DISK S
BRAKE S
DRUM
GEAR IDLER
SWITCH C-IN
BRAKE PULLY
SWITCH MIC
BRAKE MAIN T
MOTOR LOADING
GEAR WHEEL
GEAR MODE SWITCH
GUIDE TENSION CAM
GEAR CAM MAIN
LEVER CAM
HOLDER FPC SUB
MOTOR CAPSTAN
GEAR CAPSTAN
SLIDE MAIN
GEAR PULLY

Fig. 7-17

7-4-5 Stop → REW


Push REW Key.
Motor Loading rotates forward.
Drum rotates forward
Gear Worm Motor
Gear Worm Loading
Gear Wheel,
Gear Mode Switch
Gear Cam Main rotate.
Silder Main moves in direction of arrow.
Arm Tension is moved in direction of arrow by switch cam of gear mode causing tension to tape.
Brake S released from Reel S,
Pinch Roller moves in direction of arrow and attaches to Capstan Shaft, which puts the tape between roller and capstan shaft.
Motor Loading stops.
Motor Capstan rotates reverse.
* Motor Capstan rotates about 30 times faster than PLAY mode.
Gear Capstan, Belt Timming, Gear pully and Gear Idler rotate in order.
Reel totates 30 times faster than PLAY speed.
Reel S rotates 30 times faster than PLAY speed.

* This operation feeds tape 30 times faster than PLAY mode.

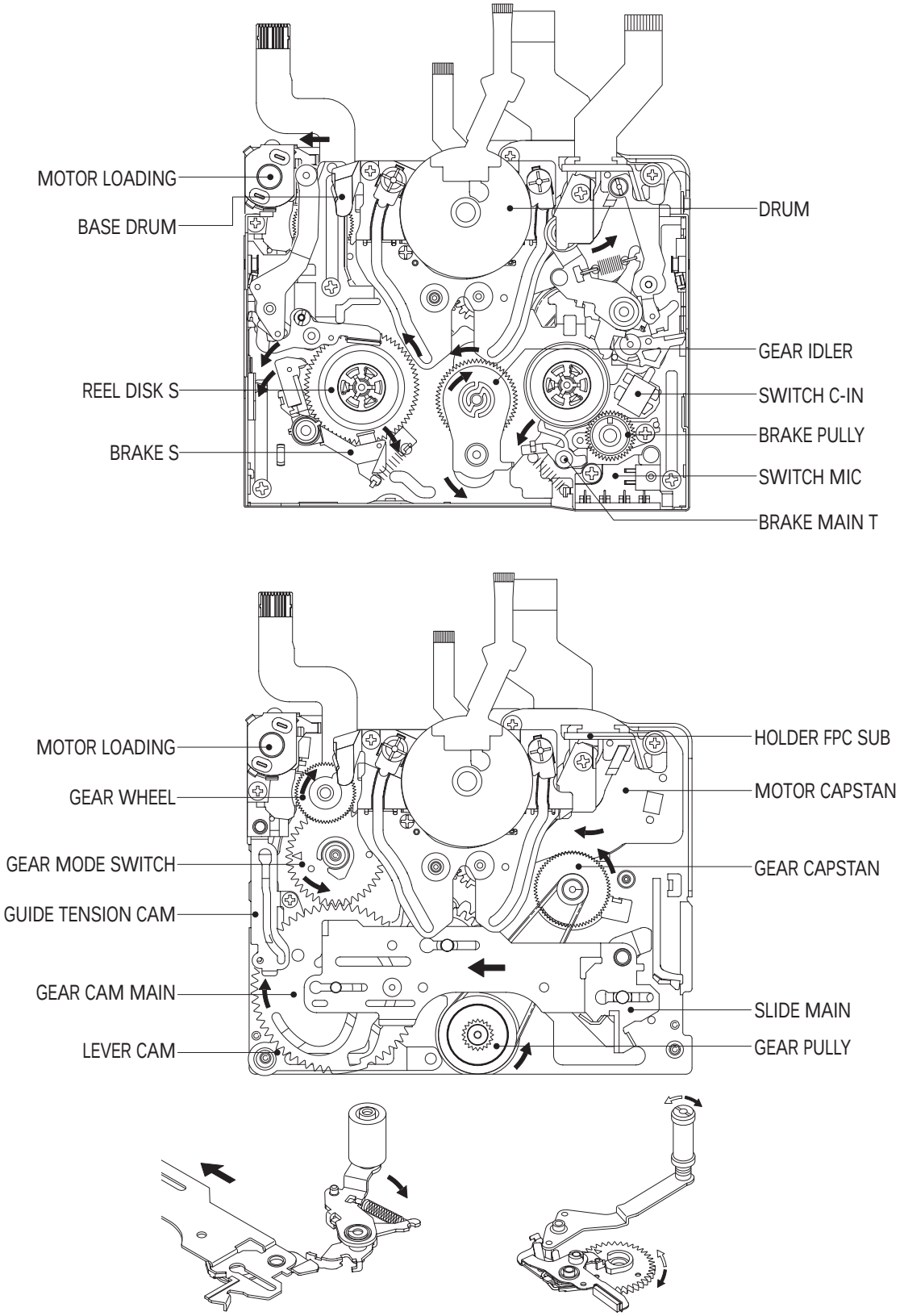
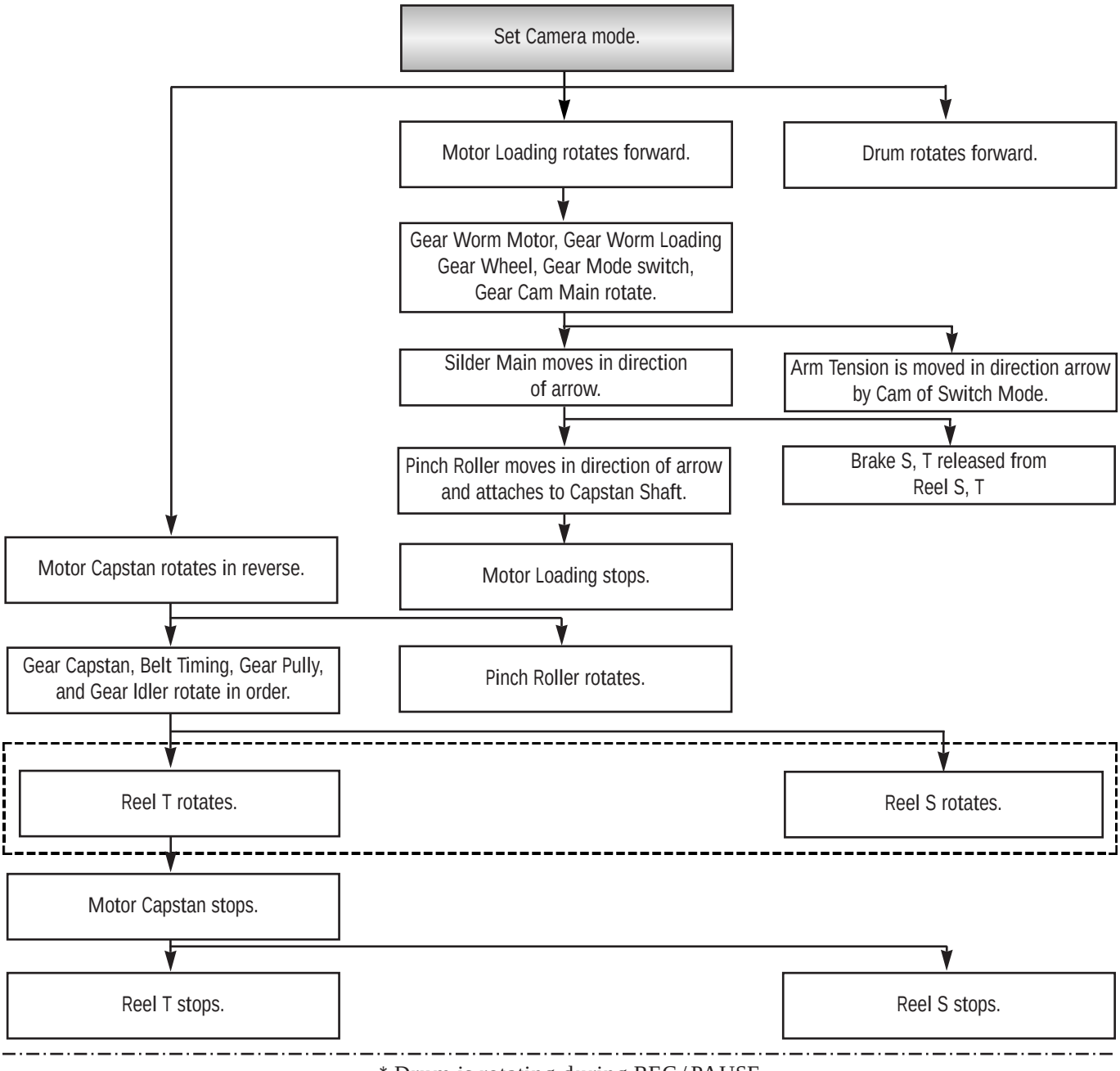
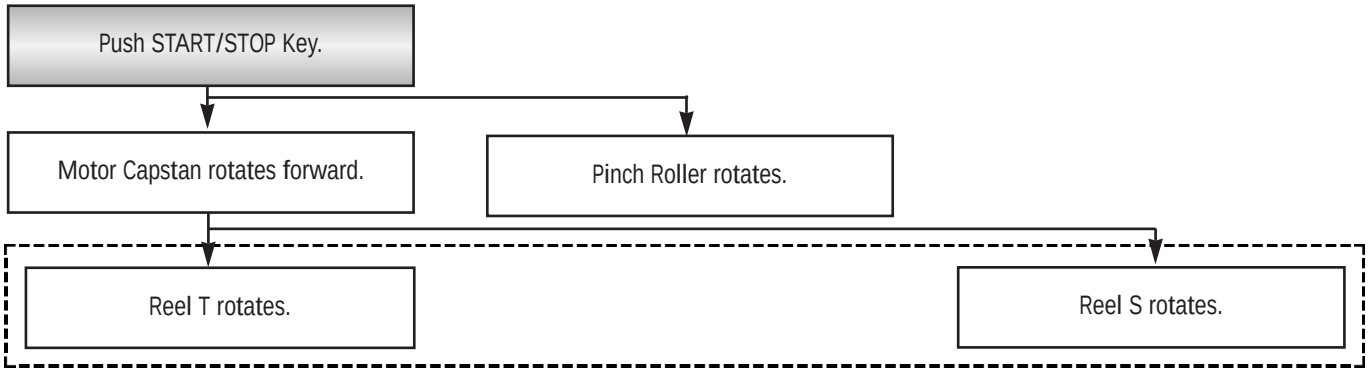

MOTOR LOADING
BASE DRUM
REEL DISK S
BRAKE S
DRUM
GEAR IDLER
SWITCH C-IN
BRAKE PULLY
SWITCH MIC
BRAKE MAIN T
MOTOR LOADING
GEAR WHEEL
GEAR MODE SWITCH
GUIDE TENSION CAM
GEAR CAM MAIN
LEVER CAM
HOLDER FPC SUB
MOTOR CAPSTAN
GEAR CAPSTAN
SLIDE MAIN
GEAR PULLY

Fig. 7-18

7-4-6 Stop → REC


Set Camera mode.
Motor Loading rotates forward.
Drum rotates forward.
Gear Worm Motor, Gear Worm Loading Gear Wheel, Gear Mode switch, Gear Cam Main rotate.
Silder Main moves in direction of arrow.
Arm Tension is moved in direction arrow by Cam of Switch Mode.
Pinch Roller moves in direction of arrow and attaches to Capstan Shaft.
Brake S, T released from Reel S, T
Motor Capstan rotates in reverse.
Motor Loading stops.
Gear Capstan, Belt Timing, Gear Pully, and Gear Idler rotate in order.
Pinch Roller rotates.
Reel T rotates.
Reel S rotates.
Motor Capstan stops.
Reel T stops.
Reel S stops.

* Drum is rotating during REC / PAUSE



* Tape is wound to Reel T by this operation.

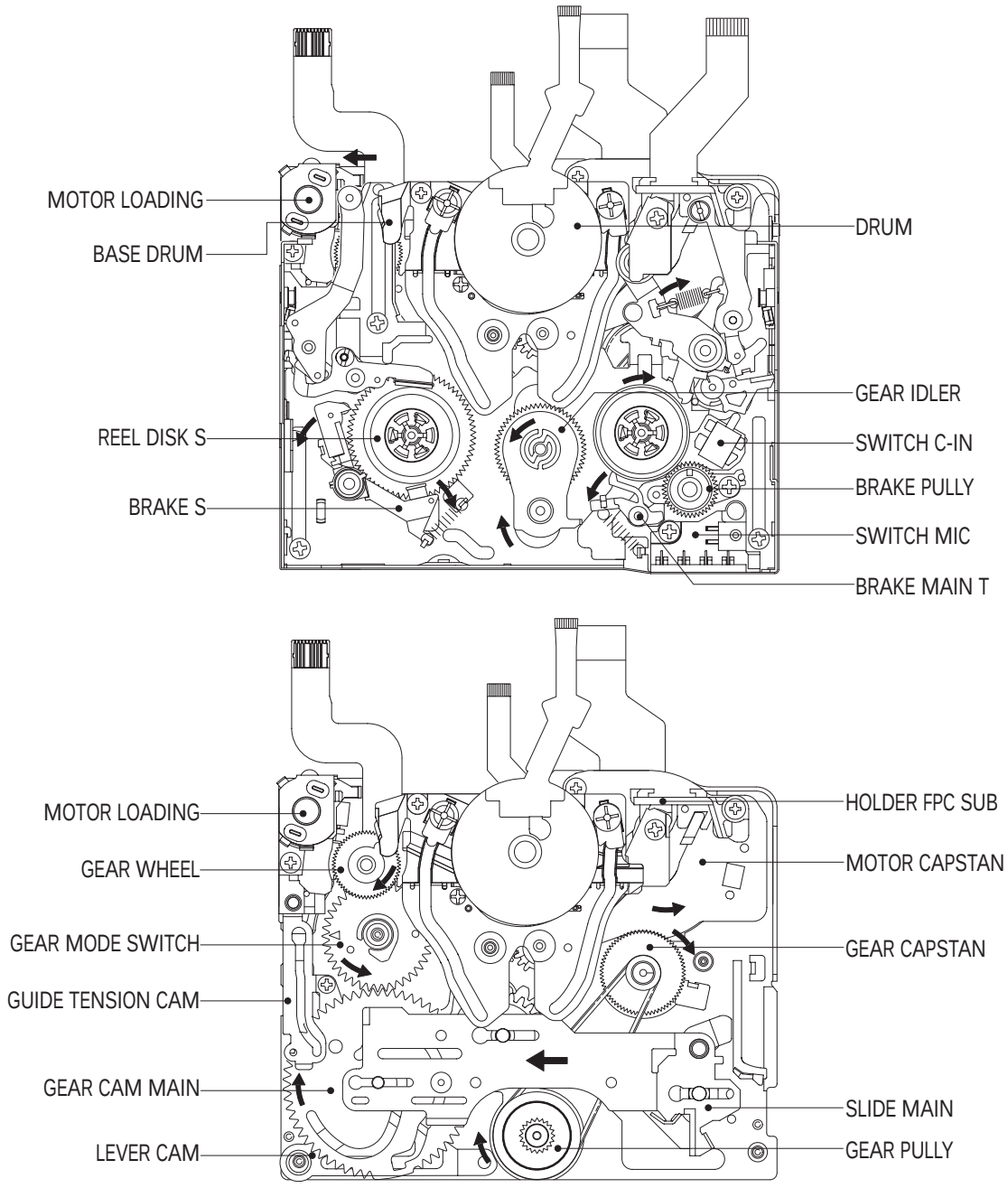
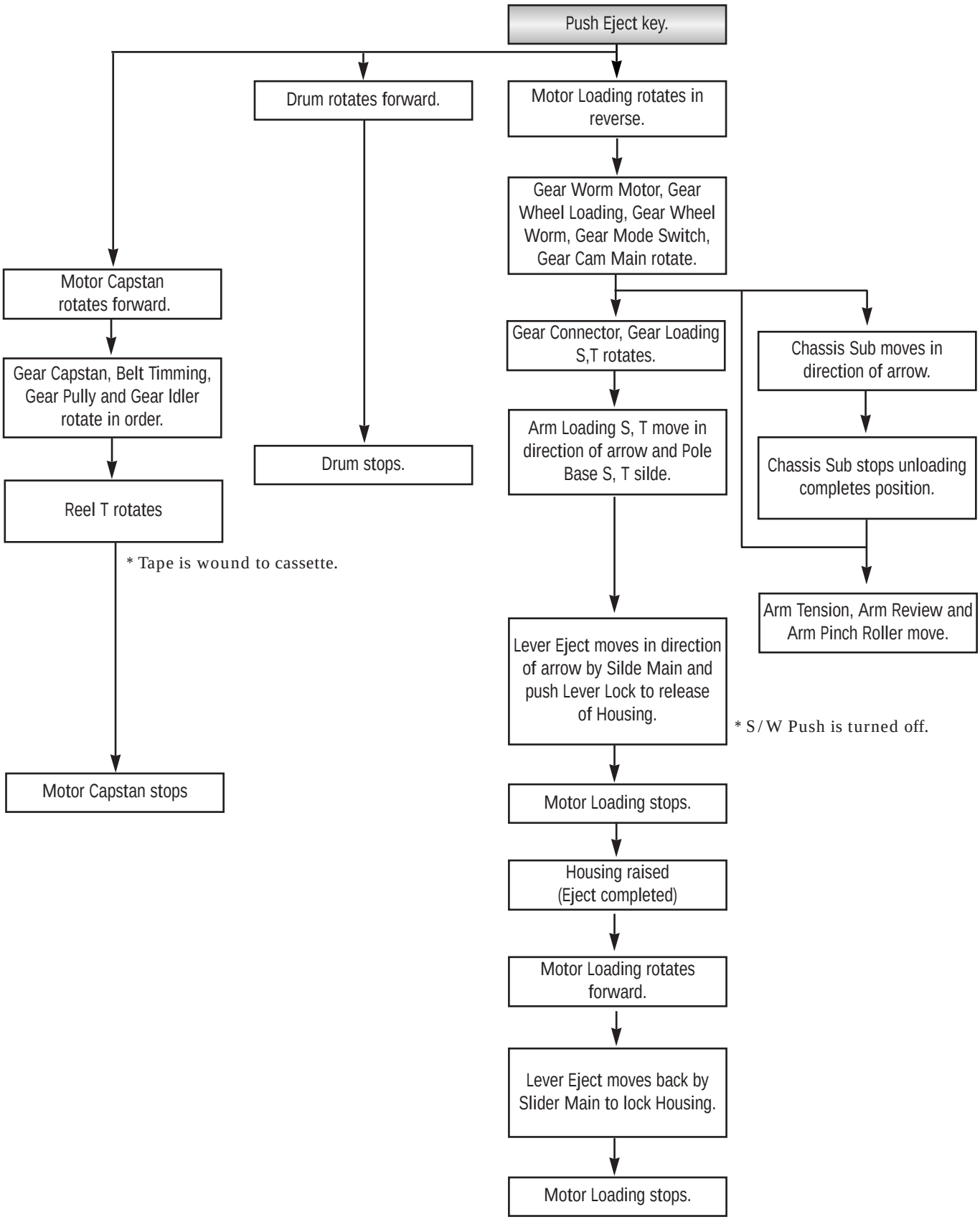

MOTOR LOADING
BASE DRUM
REEL DISK S
BRAKE S
DRUM
GEAR IDLER
SWITCH C-IN
BRAKE PULLY
SWITCH MIC
BRAKE MAIN T
MOTOR LOADING
GEAR WHEEL
GEAR MODE SWITCH
GUIDE TENSION CAM
GEAR CAM MAIN
LEVER CAM
HOLDER FPC SUB
MOTOR CAPSTAN
GEAR CAPSTAN
SLIDE MAIN
GEAR PULLY

Fig. 7-19

7-4-7 Stop → Unload


Push Eject key.
Drum rotates forward.
Motor Loading rotates in reverse.
Gear Worm Motor, Gear Wheel Loading, Gear Wheel Worm, Gear Mode Switch, Gear Cam Main rotate.
Motor Capstan rotates forward.
Gear Capstan, Belt Timming, Gear Pully and Gear Idler rotate in order.
Reel T rotates
* Tape is wound to cassette.
Motor Capstan stops
Drum stops.
Gear Connector, Gear Loading S,T rotates.
Arm Loading S, T move in direction of arrow and Pole Base S, T silde.
Chassis Sub moves in direction of arrow.
Chassis Sub stops unloading completes position.
Arm Tension, Arm Review and Arm Pinch Roller move.
Lever Eject moves in direction of arrow by Silde Main and push Lever Lock to release of Housing.
* S/W Push is turned off.
Motor Loading stops.
Housing raised (Eject completed)
Motor Loading rotates forward.
Lever Eject moves back by Slider Main to lock Housing.
Motor Loading stops.

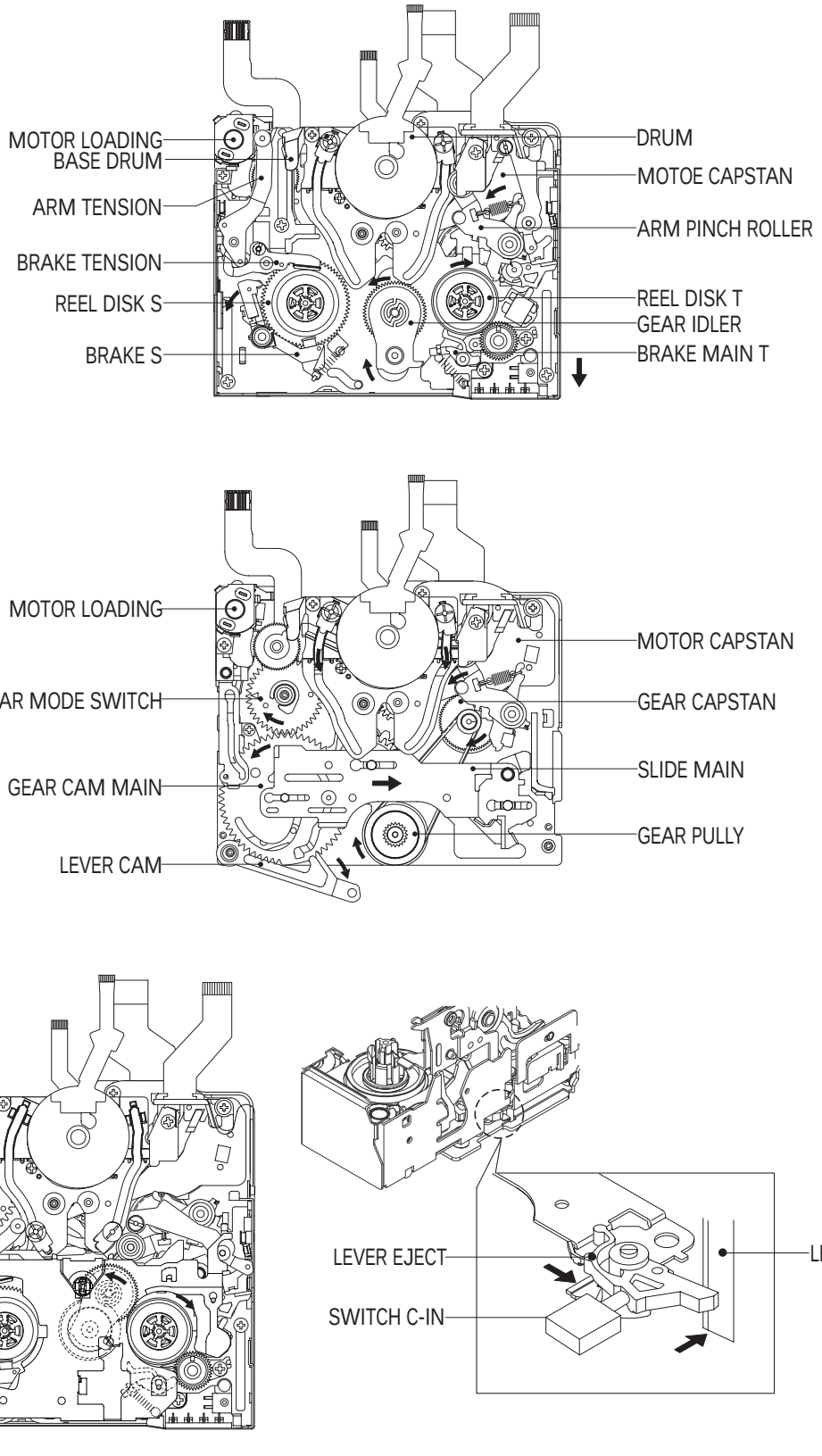
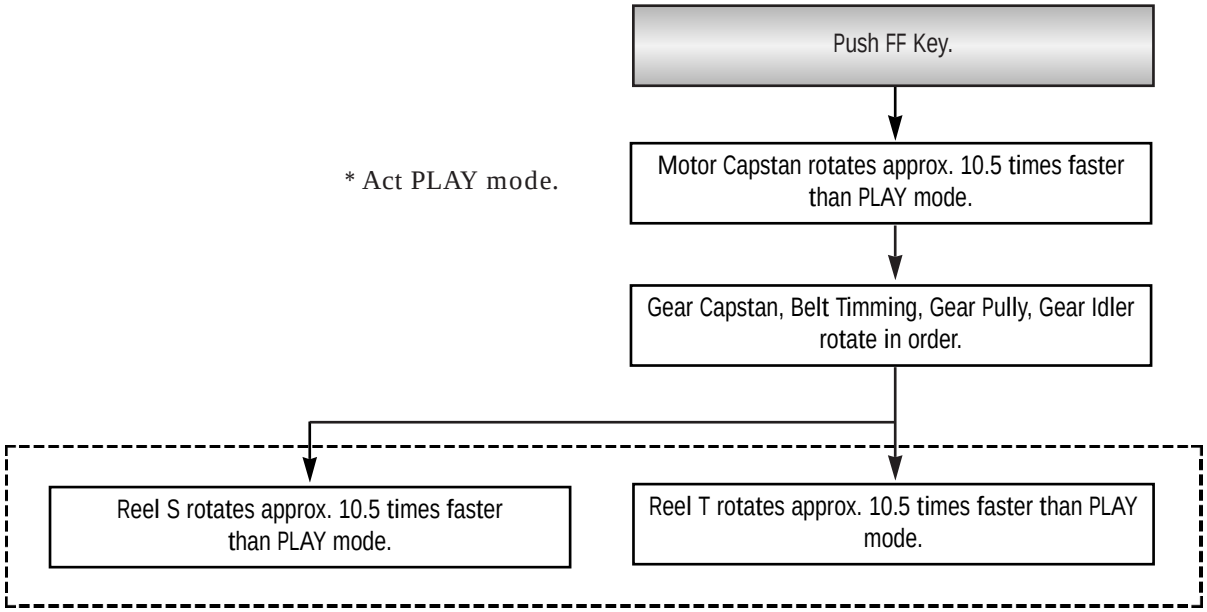

MOTOR LOADING
BASE DRUM
ARM TENSION
BRAKE TENSION
REEL DISK S
BRAKE S
DRUM
MOTOE CAPSTAN
ARM PINCH ROLLER
REEL DISK T
GEAR IDLER
BRAKE MAIN T
MOTOR LOADING
GEAR MODE SWITCH
GEAR CAM MAIN
LEVER CAM
MOTOR CAPSTAN
GEAR CAPSTAN
SLIDE MAIN
GEAR PULLY
LEVER EJECT
SWITCH C-IN
LEVER LOCK

Fig. 7-20

7-4-8 CUE


Push FF Key.
* Act PLAY mode.
Motor Capstan rotates approx. 10.5 times faster than PLAY mode.
Gear Capstan, Belt Timming, Gear Pully, Gear Idler rotate in order.
Reel S rotates approx. 10.5 times faster than PLAY mode.
Reel T rotates approx. 10.5 times faster than PLAY mode.

* Tape fed by Motor Capstan is wound up to Reel T.

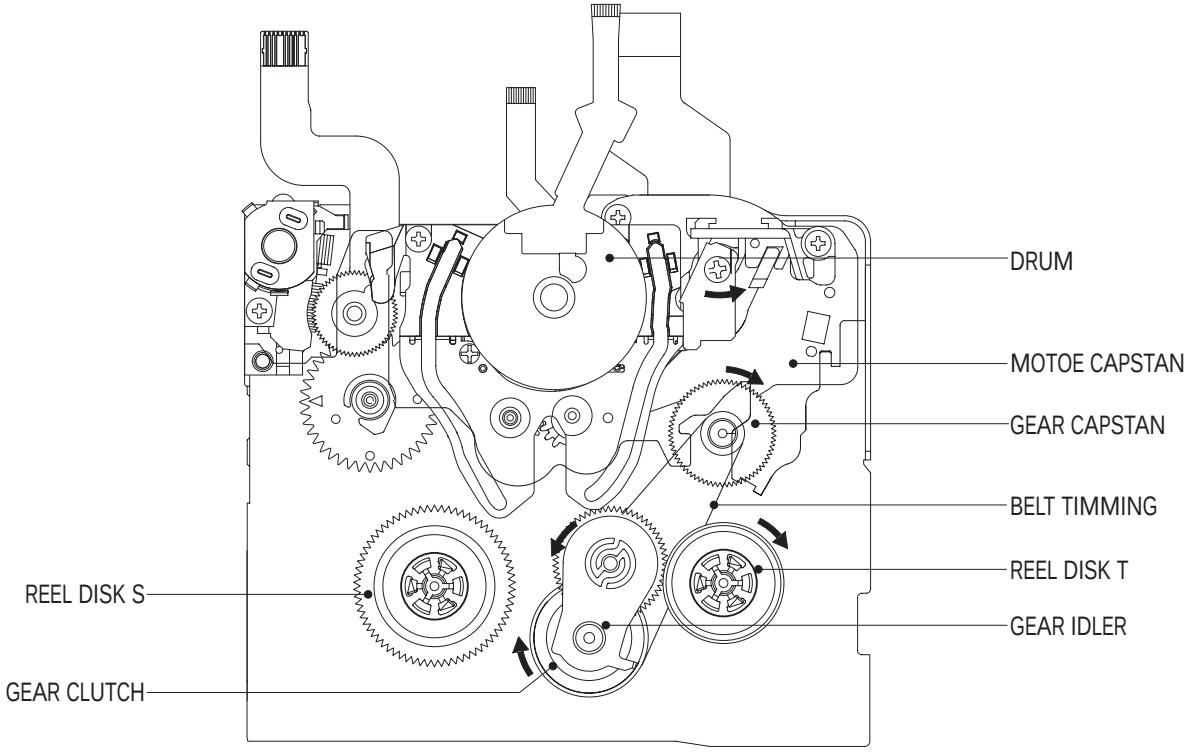
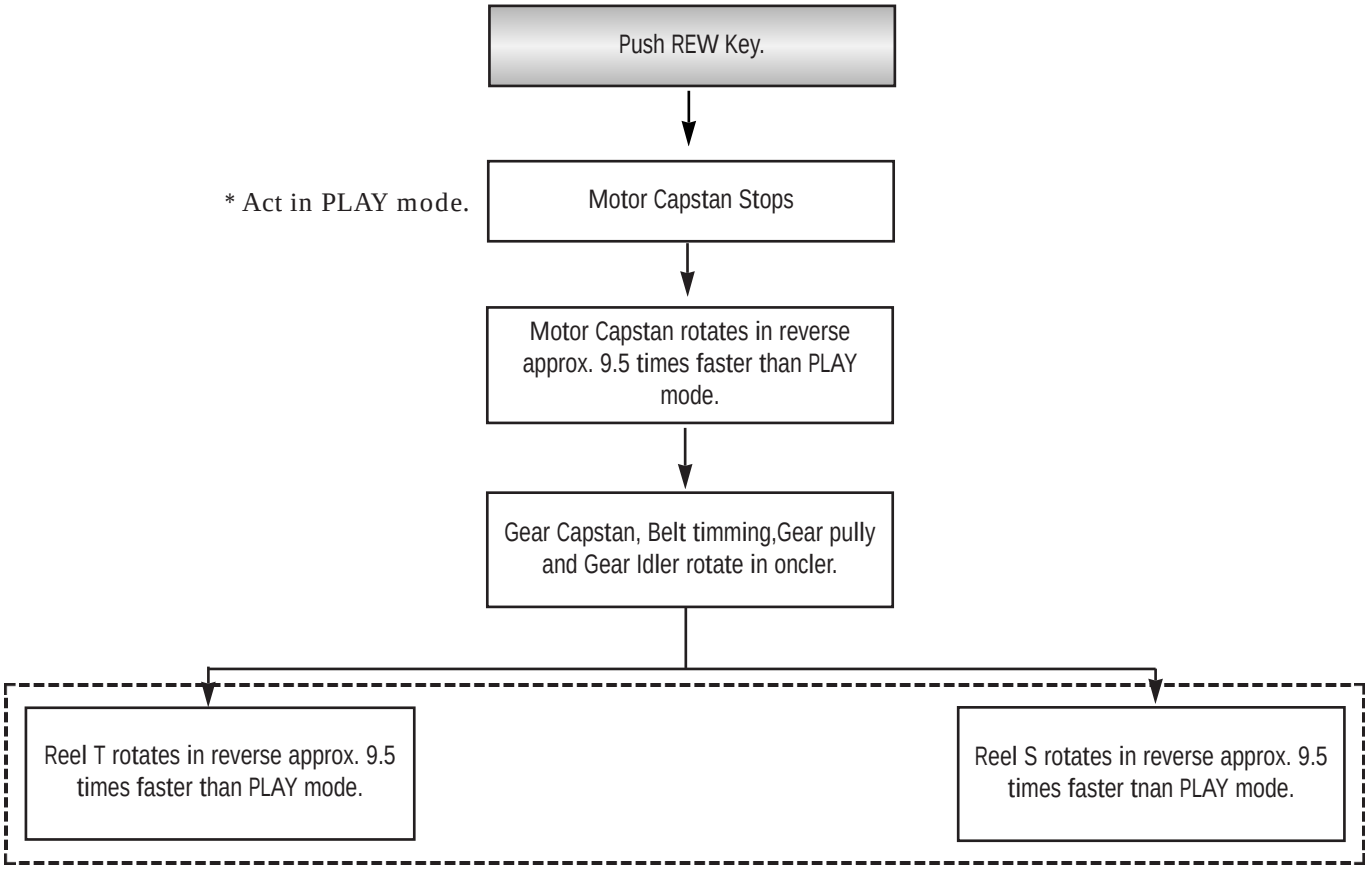

DRUM
MOTOE CAPSTAN
GEAR CAPSTAN
BELT TIMMING
REEL DISK T
GEAR IDLER
REEL DISK S
GEAR CLUTCH

Fig. 7-21

7-4-9 REW


Push REW Key.
* Act in PLAY mode.
Motor Capstan Stops
Motor Capstan rotates in reverse approx. 9.5 times faster than PLAY mode.
Gear Capstan, Belt timming,Gear pully and Gear Idler rotate in oncler.
Reel T rotates in reverse approx. 9.5 times faster than PLAY mode.
Reel S rotates in reverse approx. 9.5 times faster tnan PLAY mode.

* Tape fed by Motor Capstan is wound up to Reel S.

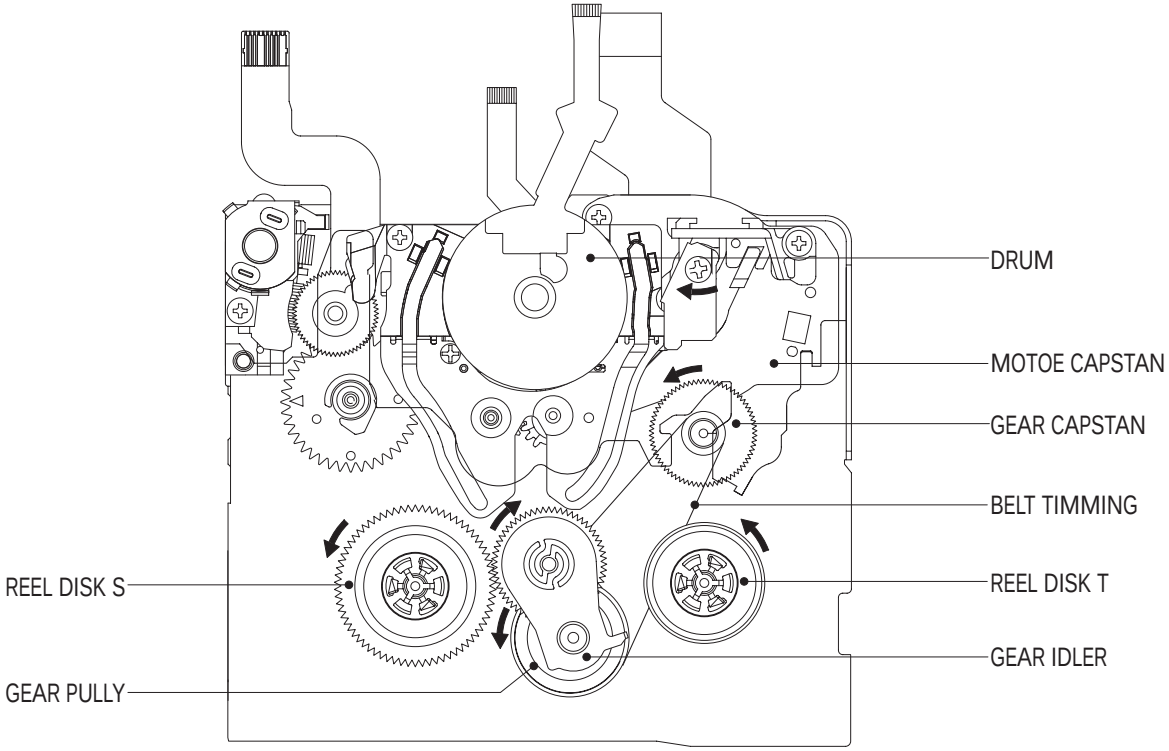

DRUM
MOTOE CAPSTAN
GEAR CAPSTAN
BELT TIMMING
REEL DISK S
REEL DISK T
GEAR IDLER
GEAR PULLY

Fig. 7-22

MEMO

4. Disassembly and Reassembly

4-1 Cabinet and PCB

4-1-1 Ass'y Case Top Removal

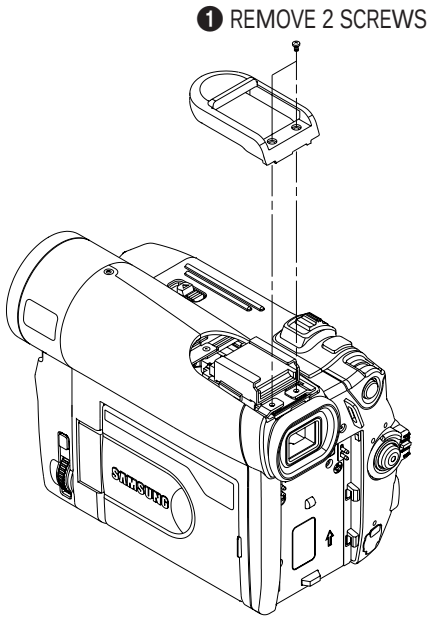


Fig. 4-1 Ass'y Case Top Removal

4-1-2 Ass'y Case Front Removal

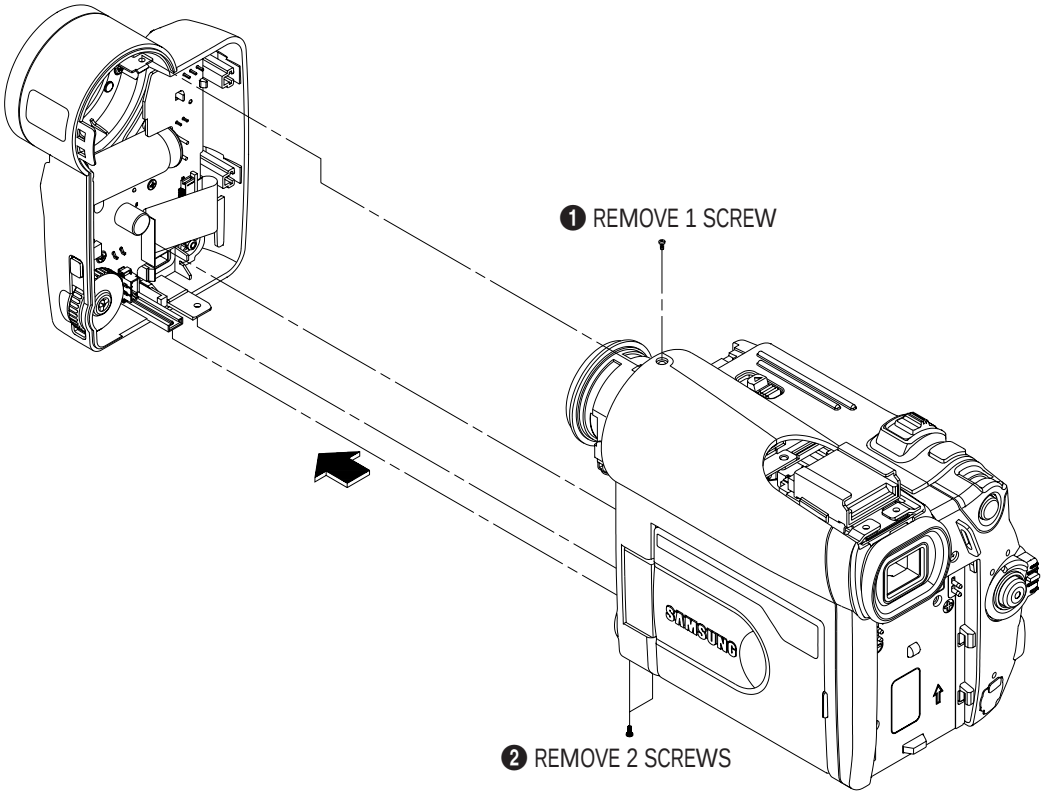


Fig. 4-2 Ass'y Case Front Removal

4-1-3 Ass'y Left Removal

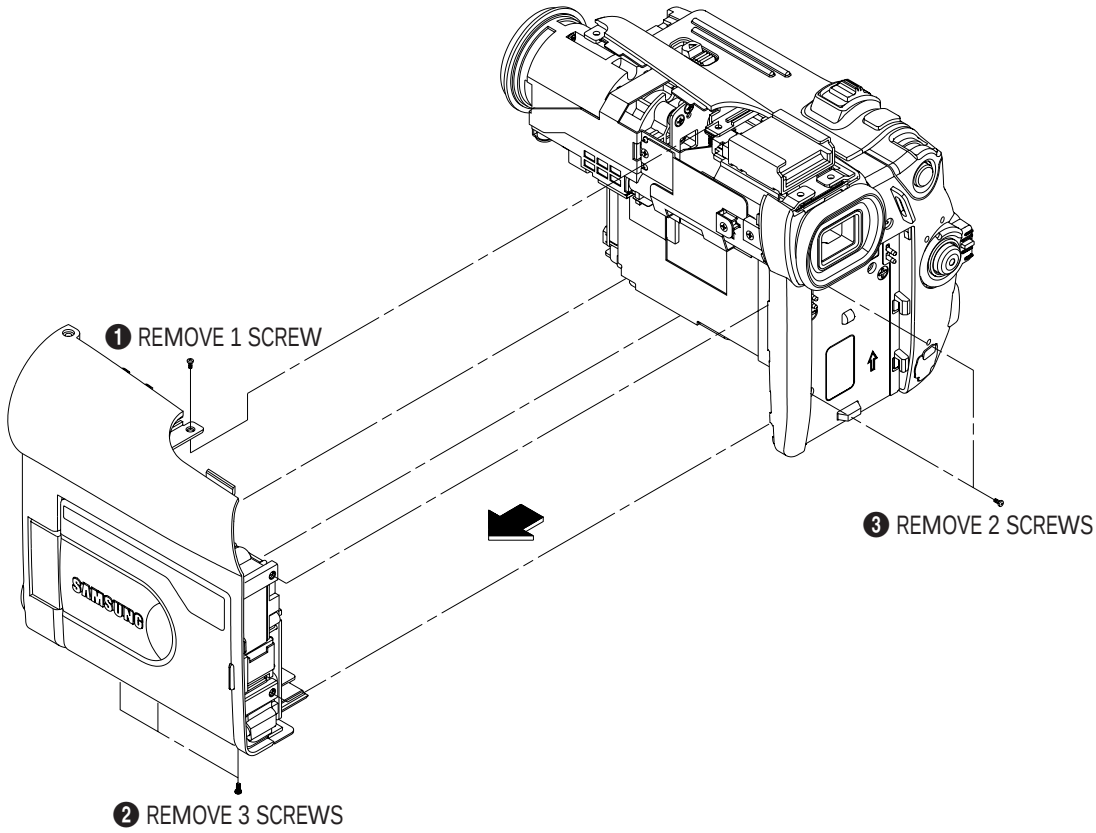


Fig. 4-3 Ass'y Left Removal

4-1-4 Ass'y Lcd Removal

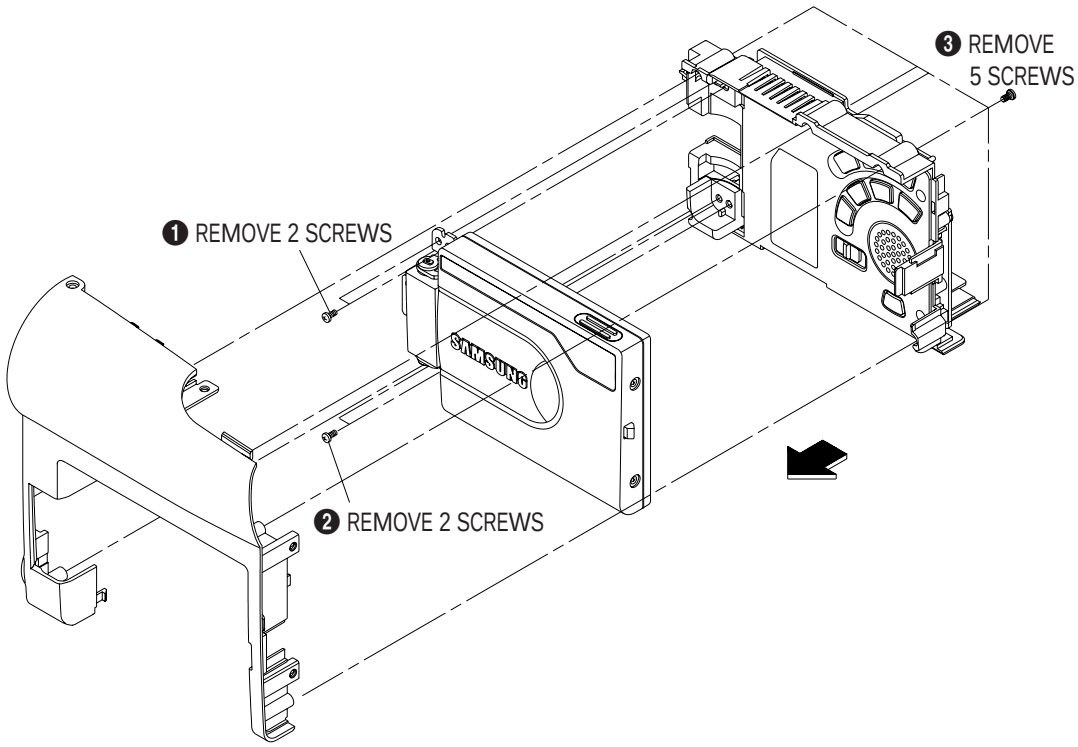


Fig. 4-4 Ass'y Lcd Removal

4-1-5 Ass'y Rear Removal

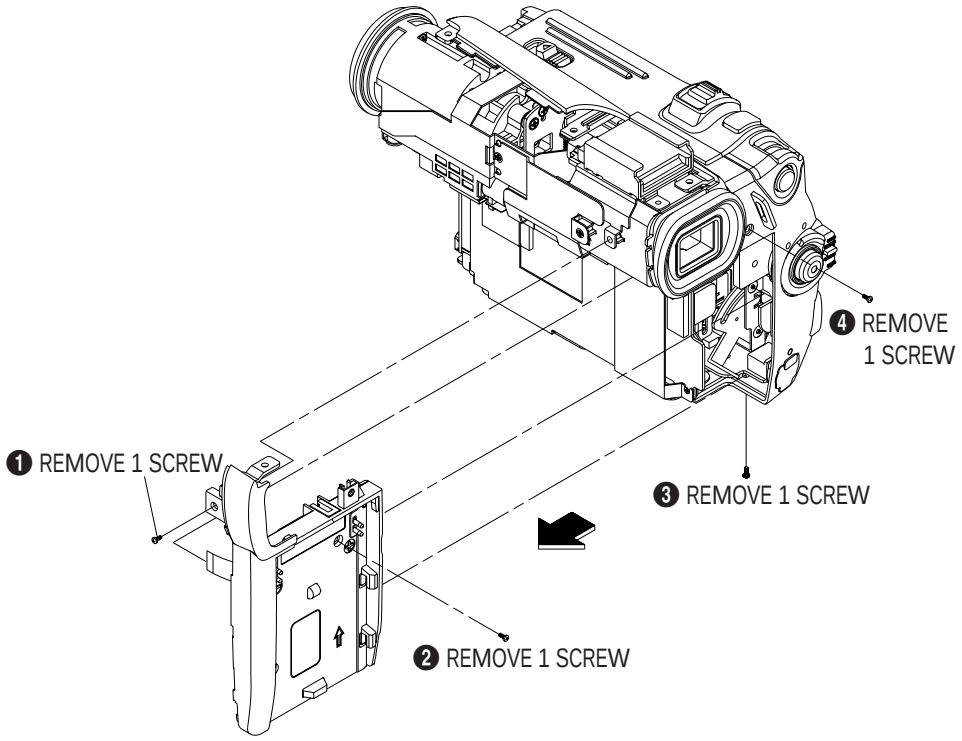


Fig. 4-5 Ass'y Rear Removal

4-1-6 Ass'y Right Removal

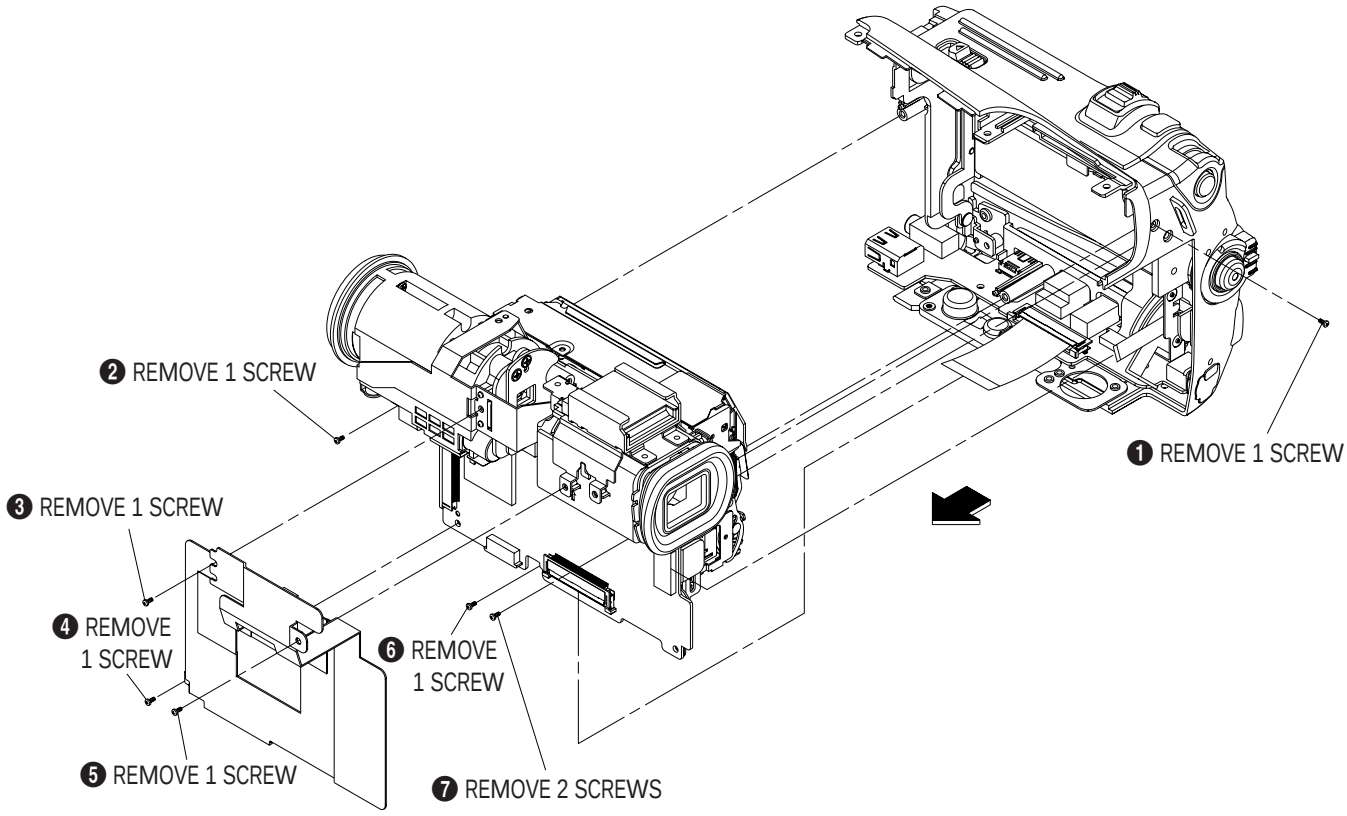


Fig. 4-6 Ass'y Right Removal

4-1-7 Ass'y Housing Removal

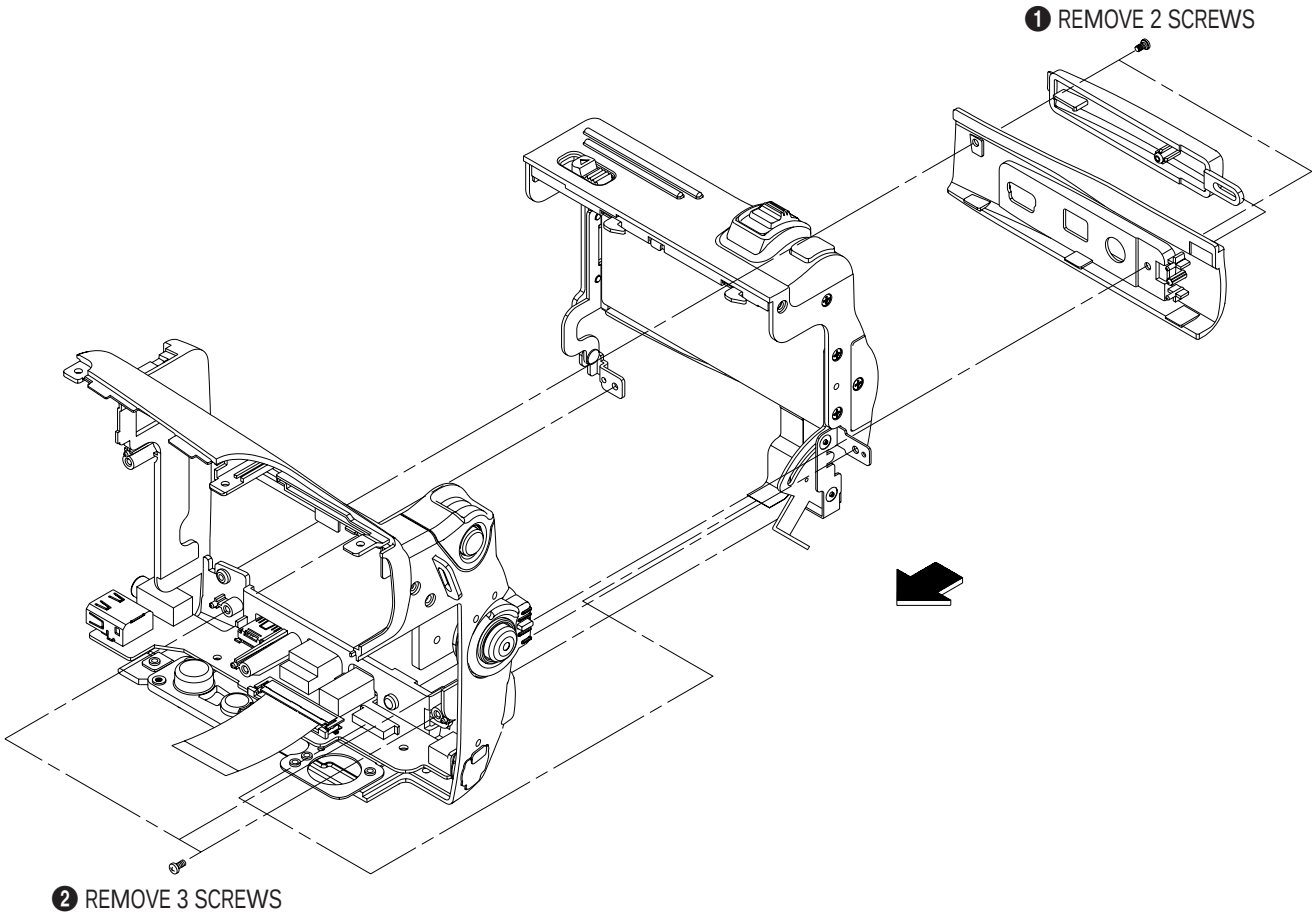


Fig. 4-7 Ass'y Housing Removal

4-1-8 Ass'y EVF Removal

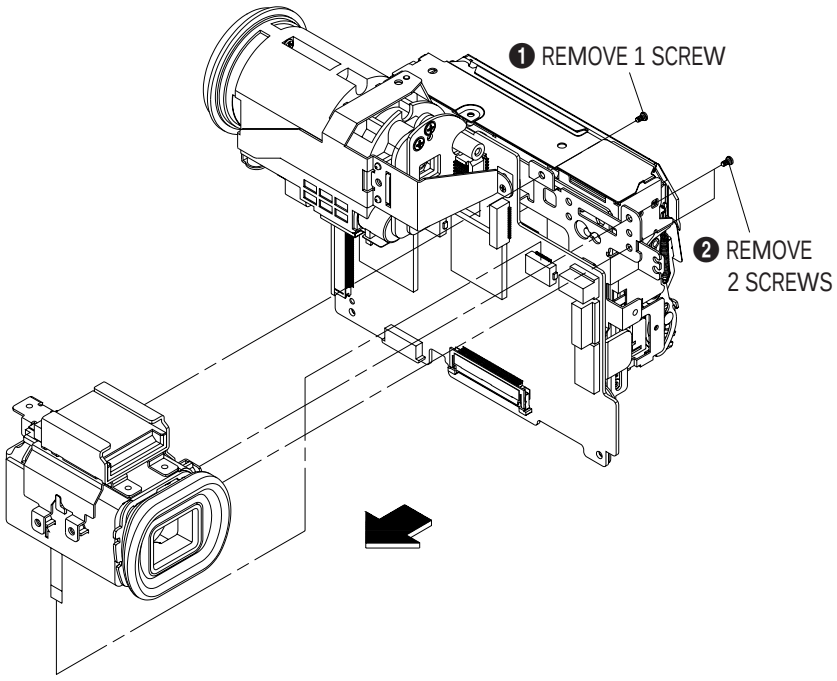


Fig. 4-8 Ass'y EVF Removal

4-1-9 Ass'y Deck Removal

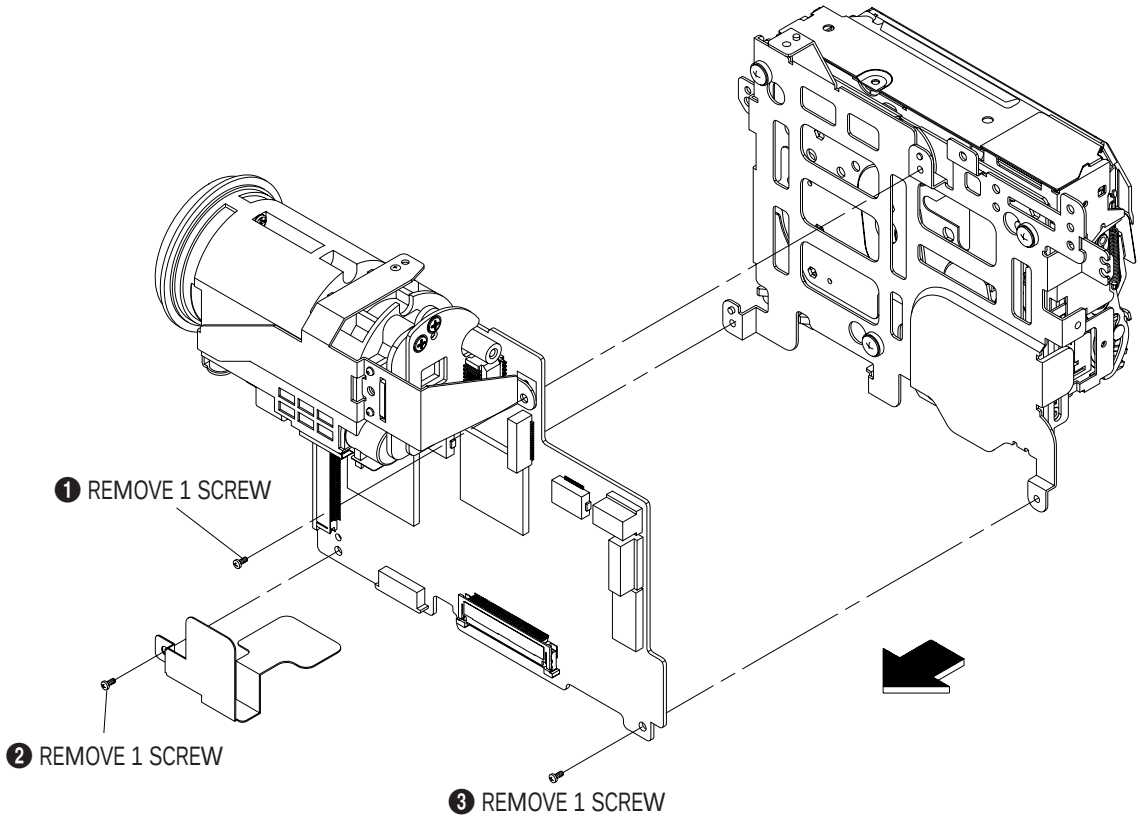


Fig. 4-9 Ass'y Deck Removal

4-1-10 Ass'y Lens Removal

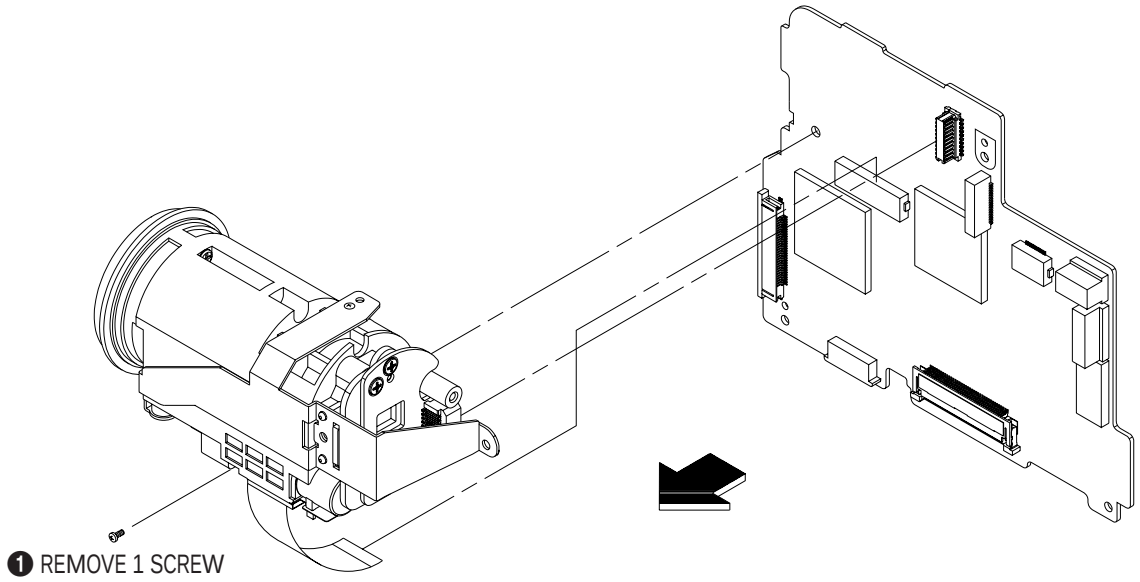


Fig. 4-10 Ass'y Lens Removal

4-2 Deck

4-2-1 How to Load and Unload (Setting the Mechanical Modes)

1) Set the power-supply output to approximately 5V, and connect it to the Motor Loading.
2) Choose the polarity depending on whether loading or unloading. (See Table 4-1)
3) Supply the voltage to the Motor Loading.

<Table 4-1>

❶	❷	Movement of chassis
+	–	Loading
-	+	Unloading

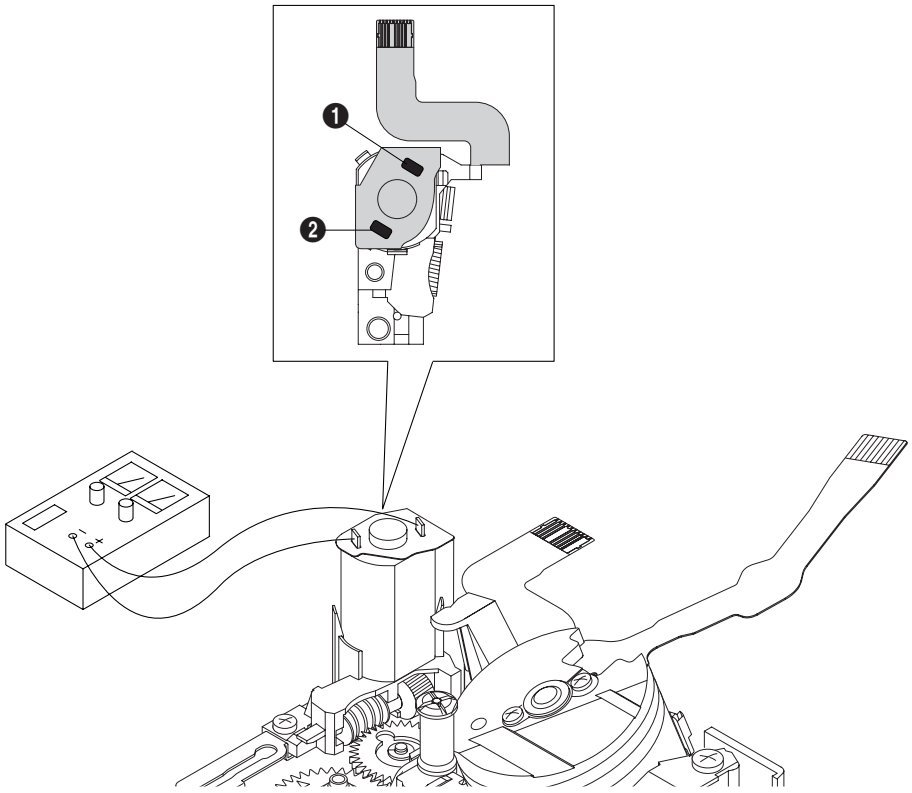


Fig. 4-11 Loading and Unloading

4-2-2 Housing Ass'y

4-2-2(a) Disassembly

Note : Do disassembled and reassembly in the unloading.

1) Push the Lever(see arrow A, Detail) turn the Lever Lock ❶ in the direction of arrow B, and open the Housing.
2) Remove the screw ❷, and separate the Hook L and Hook R and then lift it.
3) Separate the Lever L ❹ and Lever R from the Stud-housing L ❺ and stud-housing R ❻, and then lift the Housing Ass'y.

4-2-2(b) Reassembly

1) Mount the Cam L and Cam R of Lever Housing ❹ to stud Housing L ❺ and stud Housing R ❻.
2) Put the Hook L ❸ and Hook R into the Sub chassis ❽, pushing them in the direction of A, and then reassembled Housing Ass'y ❼ into the Sub chassis ❽.
3) Secure the screw ❷.

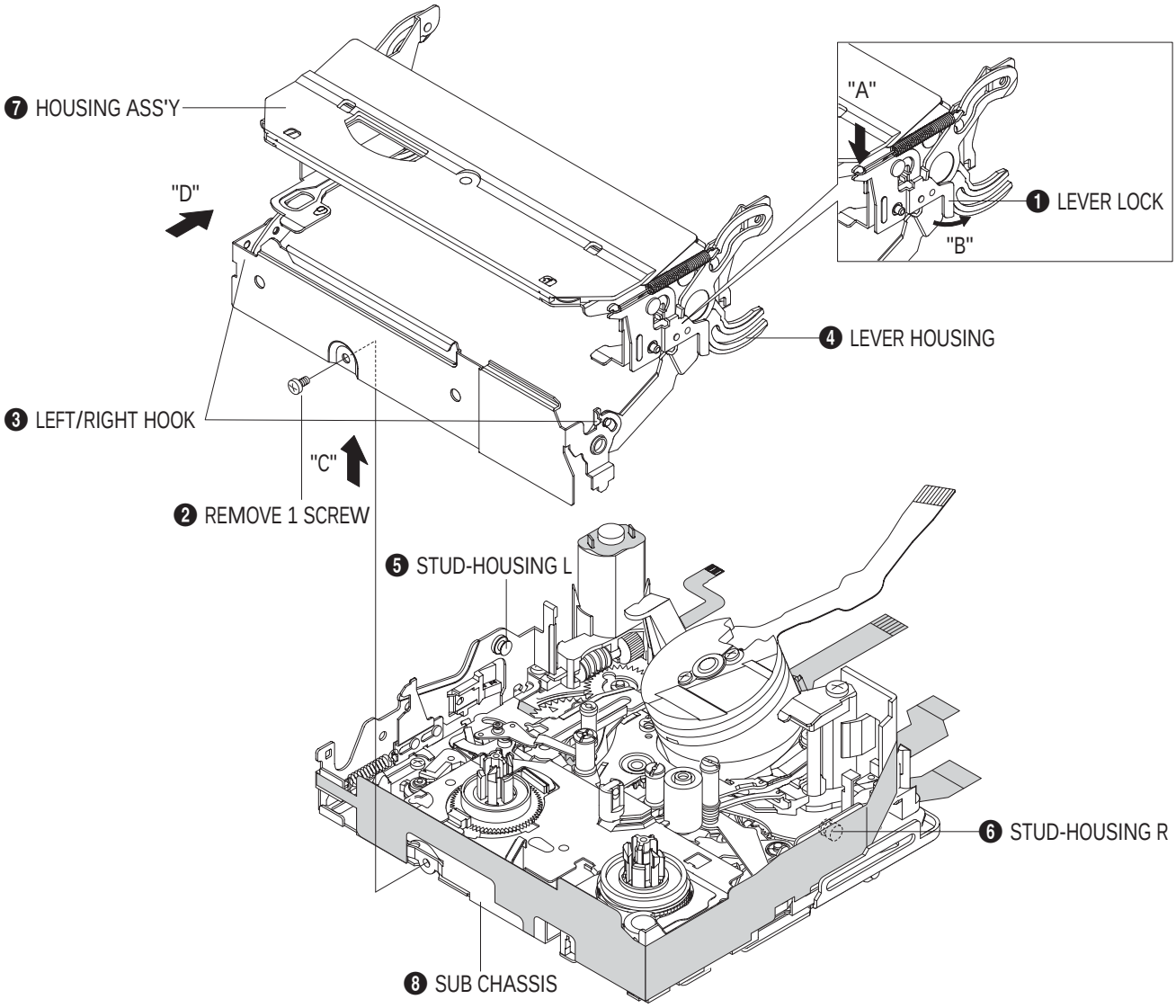


Fig. 4-12 Housing Ass'y

4-2-3 Cover Reel Ass'y, Idler Ass'y

4-2-3(a) Disassembly

1) Remove the screw ❶, then lift the Cover Reel Ass'y ❷ in the direction of arrow.
2) Remove the Washer Slit ❸, then lift the Idler Ass'y ❹.

4-2-3(b) Reassembly

1) Fit the Idler Ass'y ❹ into the Pin, then install the Washer Slit ❸.
2) Mount the Cover Reel Ass'y ❷ to the Sub chassis in the reverse direction of arrow.
3) Secure the screw ❶.

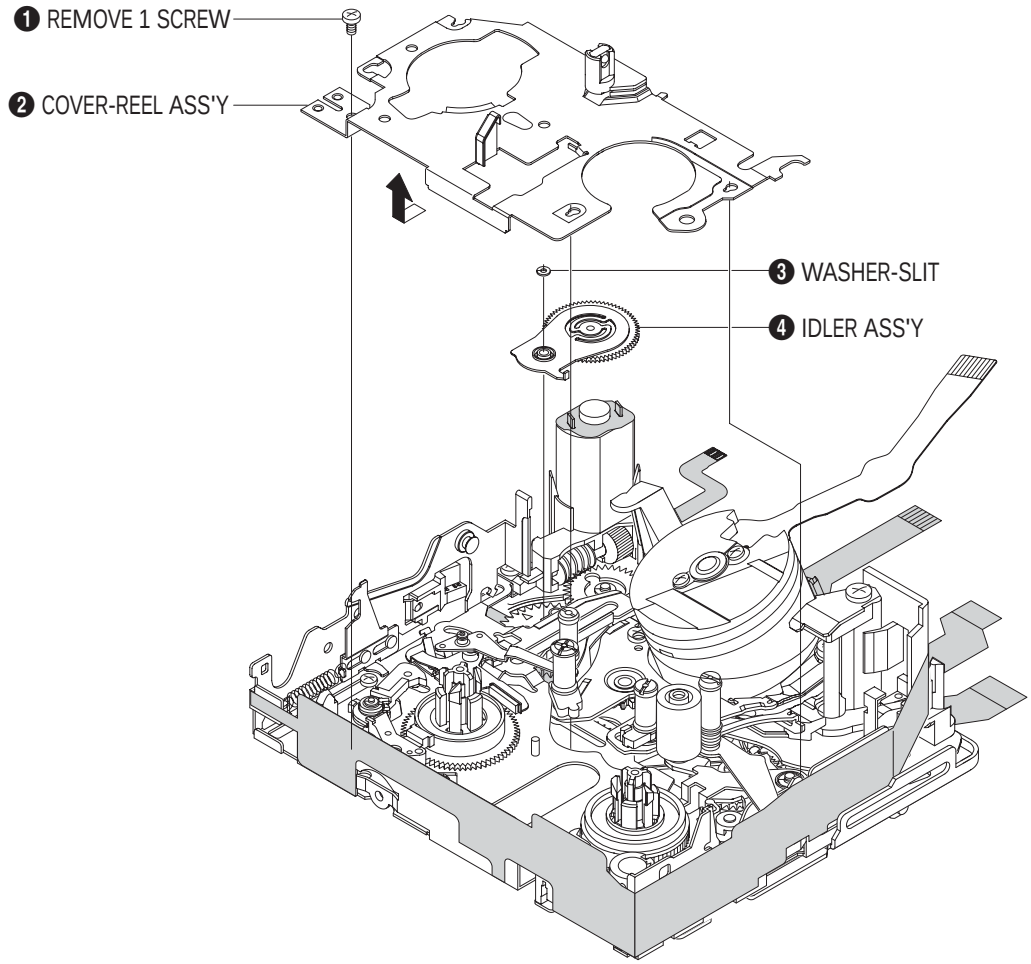


Fig. 4-13 Cover Reel Ass'y, Idler Ass'y

4-2-4 Sub Chassis

4-2-4(a) Disassembly

Note 1 : when disassembling, take care not to damage any parts.
Do not stain the rollers and poles with oil or grease.
Note 2 : Always remove the Sub-Chassis Ass'y.
When the Deck Ass'y is in unload mode.

1) Released Sub-FPC.
2) Remove 3 screws ❶.
3) Lift the Sub-chassis Ass'y ❺ from Main-chassis Ass'y ❻.

4-2-4(b) Reassembly

1) Push the arm Tension Ass'y ❹ in the direction of arrow A, insert Pin Lever Cam ❼ of main-chassis Ass'y ❸ into the Sub-chassis cam ❺ of Sub-chassis Ass'y ❷.
2) Fit the screw locking holes (❸ points) of Sub-chassis Ass'y ❷ to the Guide Pin ❽ of Main-chassis Ass'y.
3) Secure 3 Screws.

Note 1 : After assembling ❷ with ❸ make sure that Sub-chassis Ass'y ❷ loads and unloads correctly by applying 5V to the Motor Loading.
Note 2 : when reassembling, confirm that pin of Arm-review insert into the Guide-Cam.

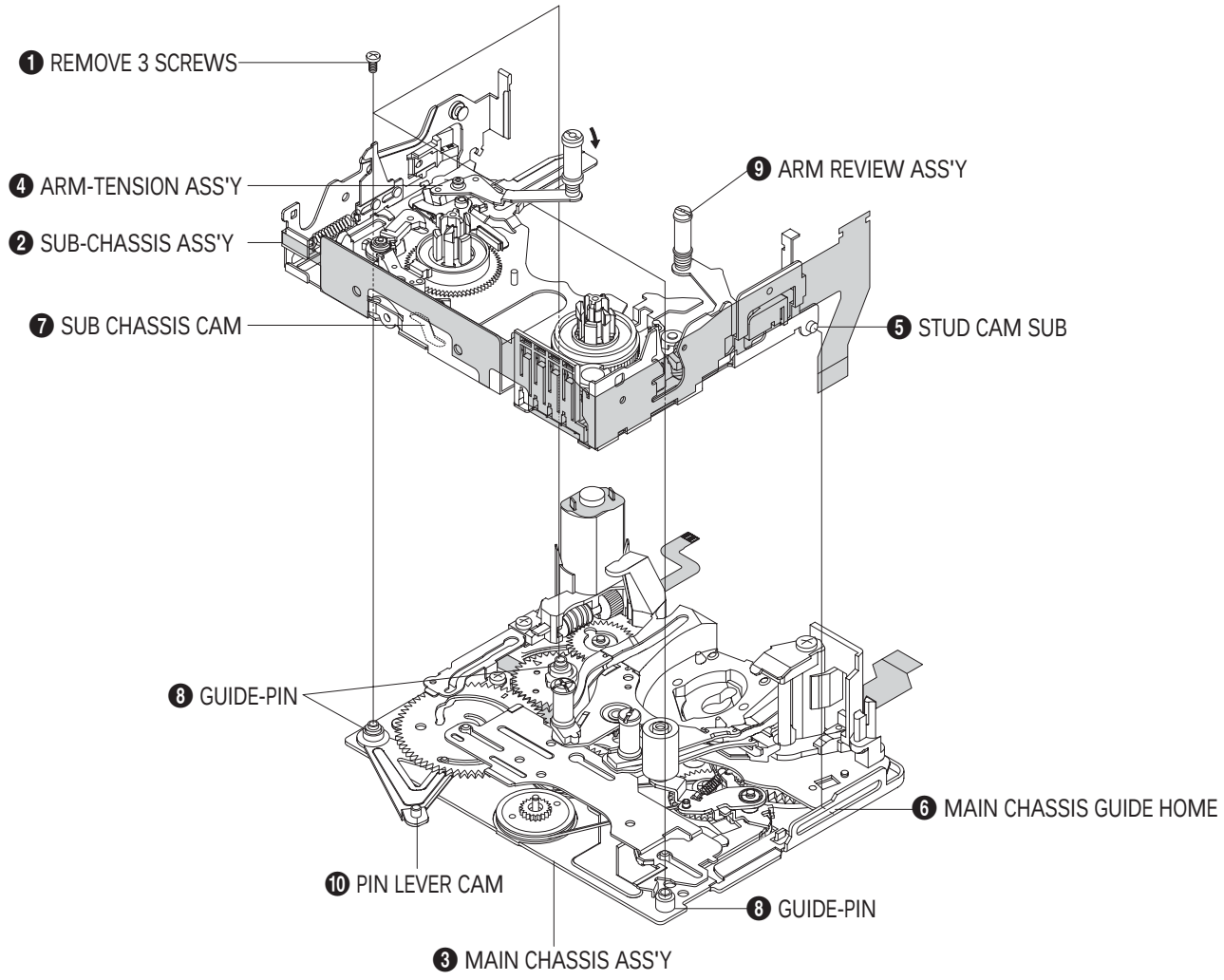


Fig. 4-14 Sub Chassis

4-2-5 Arm-Tension and Arm-Review

Note : When disassembling, take care not to deform the part. Do not stain the roller and post.

4-2-5(a) Disassembly

1) Separate the spring-Tension ❷ from Hook ❽ of sub-chassis.
2) Remove the Washer-slit ⓫, and then lift up the Arm-Tension ❶.
3) Lift up the Brake-Tension ❸ and the Tension Release ❹.
4) Lift up the Arm-Review ❺.

4-2-5(b) Reassembly

1) Insert the Arm Review ❺ into the pin1 ❽.
2) After Tension Release ❹ assembled to the pin 3 ❿, Brake-Tension ❸ insert in the pin 3 ❿.
3) When Arm-Tension ❶ insert in the pin 2 ❾, pin of Arm-Tension ❻ assembled into cam part ❺ of Brake Tension.
4) Assambled the Washer-slit ⓫.
5) Hang the spring Tension ❷ to the hook of Brake Tension ❸ and hook of sub-chassis ❽.

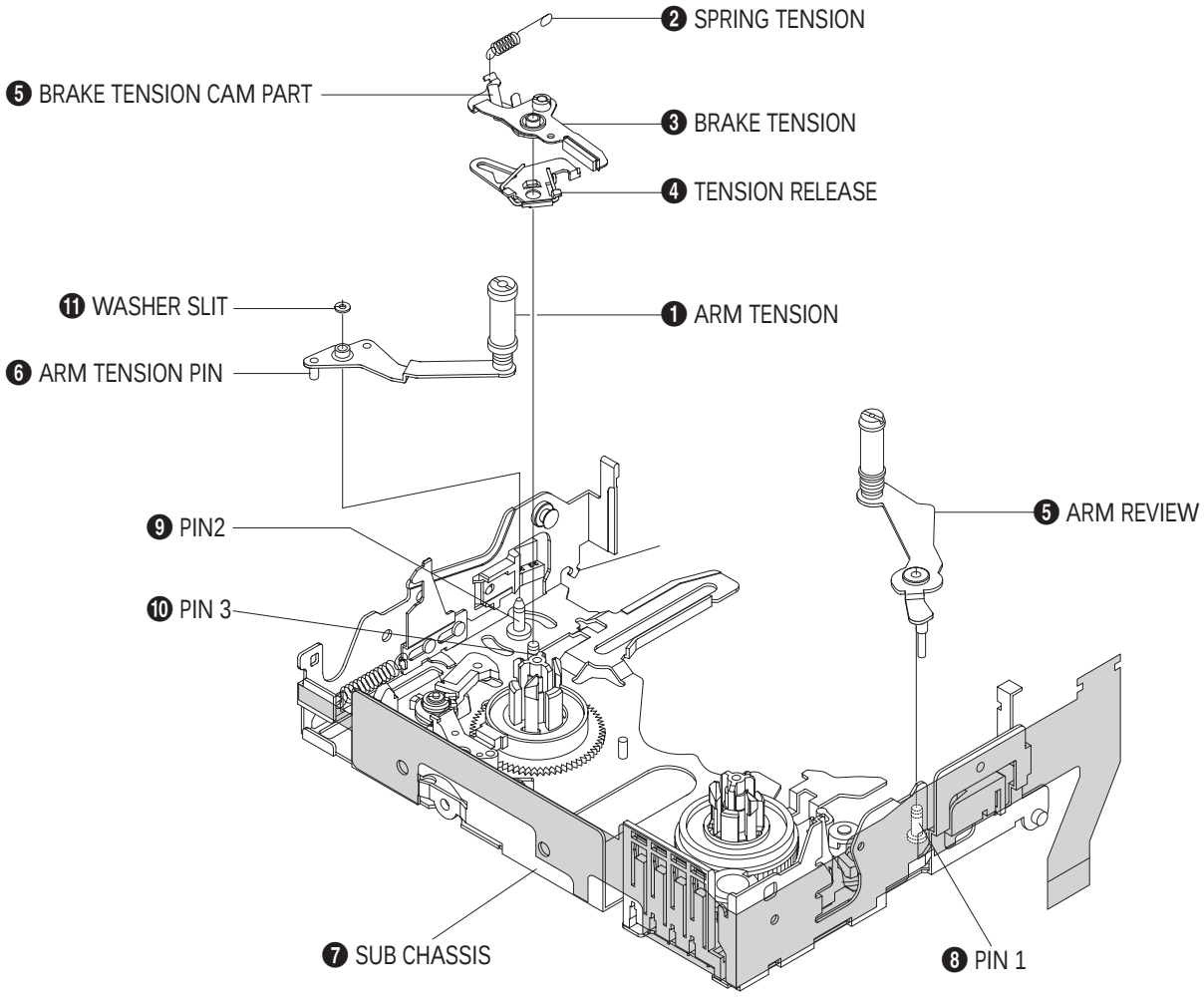


Fig. 4-15 Arm Review and Arm Tension

4-2-6 Reel Disk S, T, Brake S, Brake Main T, Brake Pully, Lever Eject

4-2-6(a) Disassembly

1) Separate the spring Brake S ❺ from the spring hook ⓫, and then lift it up.
2) Remove the washer-slit ❹, lift up the Brake S ❸.
3) Separate the spring Main Brake T ❼ from the spring hook ⓫, lift up the Brake Main T ❻.
4) Lift up the Reel S ❶, T ❷.
5) Remove the screw 1EA ❾, lift the Brake pully ❽.
6) Lift up the Lever Eject ⓾.

4-2-6(b) Reassembly

1) Mount the Lever Eject ⓾.

Note : "A" part of the Lever Eject ⓾. Put to the left of sub chassis stopper ⓬.

2) Mount the Brake pully ❽, secure the 1 screw ❾.
3) Insert the washer slit ❶.
4) Mount the Brake main T ❻, hang the spring Main Brake T ❼ to the spring hook ⓫.
5) After Mount the Brake S ❸ and insert the washer slit ❹, and then hang the spring Brake S ❺ to the spring hook ⓫.

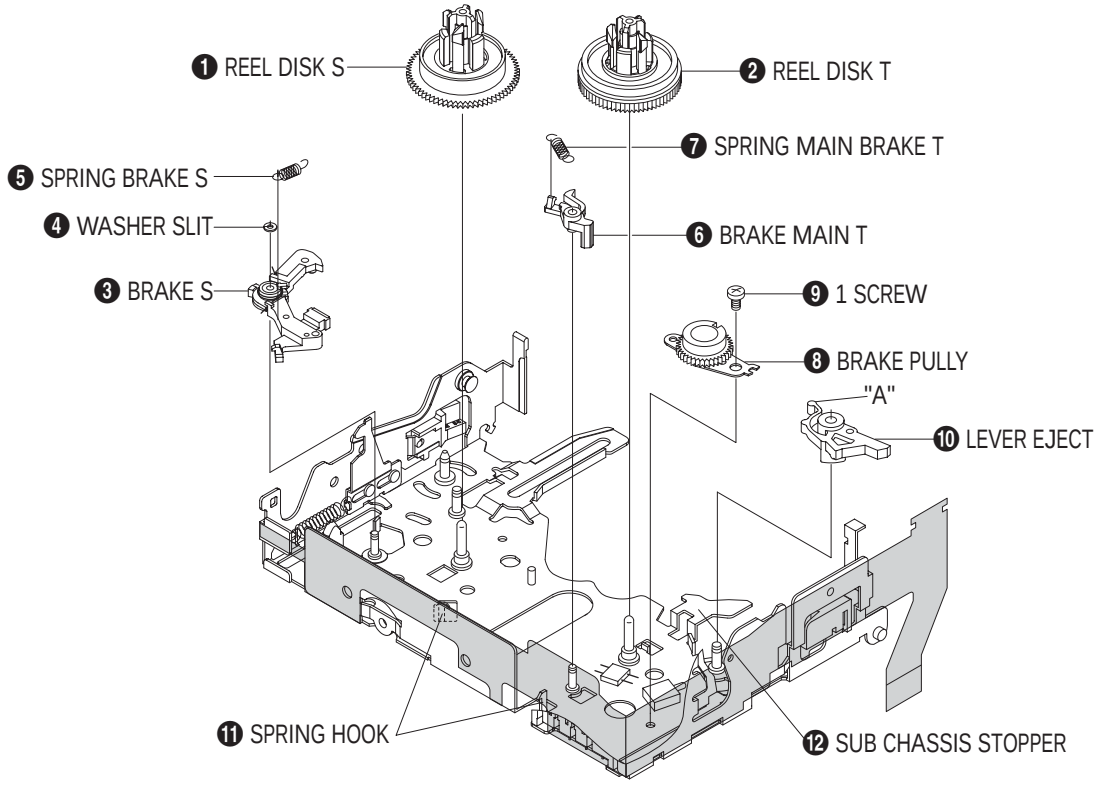


Fig. 4-16 Reel Disk S/T, Brake S, Brake Main T, Brake Pully, Lever Eject

4-2-7 Drum

4-2-7(a) Disassembly

Note1 : Do not touch the Head tip ❶ when removing or reassembling the Drum ❶.
Note2 : Do not touch the Roller S ❶, T ❶ when removing or reassembling the Drum ❶.

1) Remove 1 screw ❹ and then remove the spring plate Drum ❸.
2) Remove the Drum ❶.

4-2-7(b) Reassembly

1) Mount and insert the Drum ❶ to the Bosses ❺.
2) Insert the spring plate Drum ❸, and secure the 1 screw ❹.

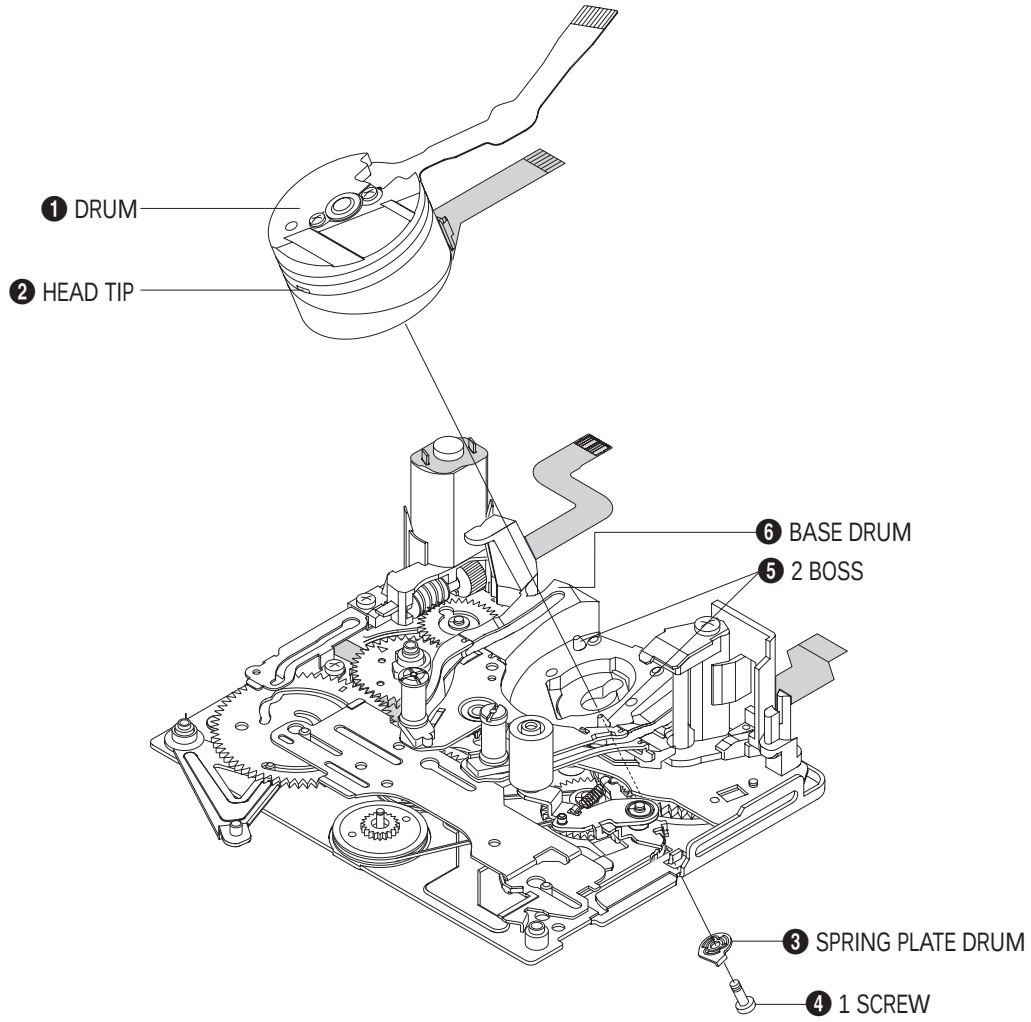


Fig. 4-17 Drum

4-2-8 Guide Rail Ass'y

4-2-8(a) Disassembly

Note1 : When removing or reassembly, do not touch Guide Roller S ❹ and Roller T ❺. (Protection Stein)
Note2 : When removing or reassembly,the Guide Roller S ❹ and T ❺, be careful not to deform the Guide Rail ❷.(pushing the cautious)

1) Remove the 3 screw ❶ in the up and the 1 screw ❼ in the back, lift up the Guide rail Ass'y ❷.
2) Separate it and turn to count clock wise the Guider Roller S ❹ and T ❺, and then separate the spring Guide Roller 2 ❻.

4-2-8(b) Reassembly

1) Insert the Spring Guide Roller 2 ❻ to the pole Base S ❽ and T ❾, and then assemble the Guide Roller S ❹ and T ❺ as turn to count clock wise.
2) After Pole Base S ❽ and T ❾ unloading mode, and then assemble Guide Rail Assy ❷ to the Main chassis ❿ and secure the screw 3 ❶ in the up and the 1 screw in the back ❼.

Note 1 : When removing and reassembling Guide Rail Ass'y, Be careful not to assemble point.
Note 2 : Disassemble and reassemble in unload mode.
Note 3 : After assembling, make sure that loading and unloading work correctly by applying 5V to the Motor Loading.

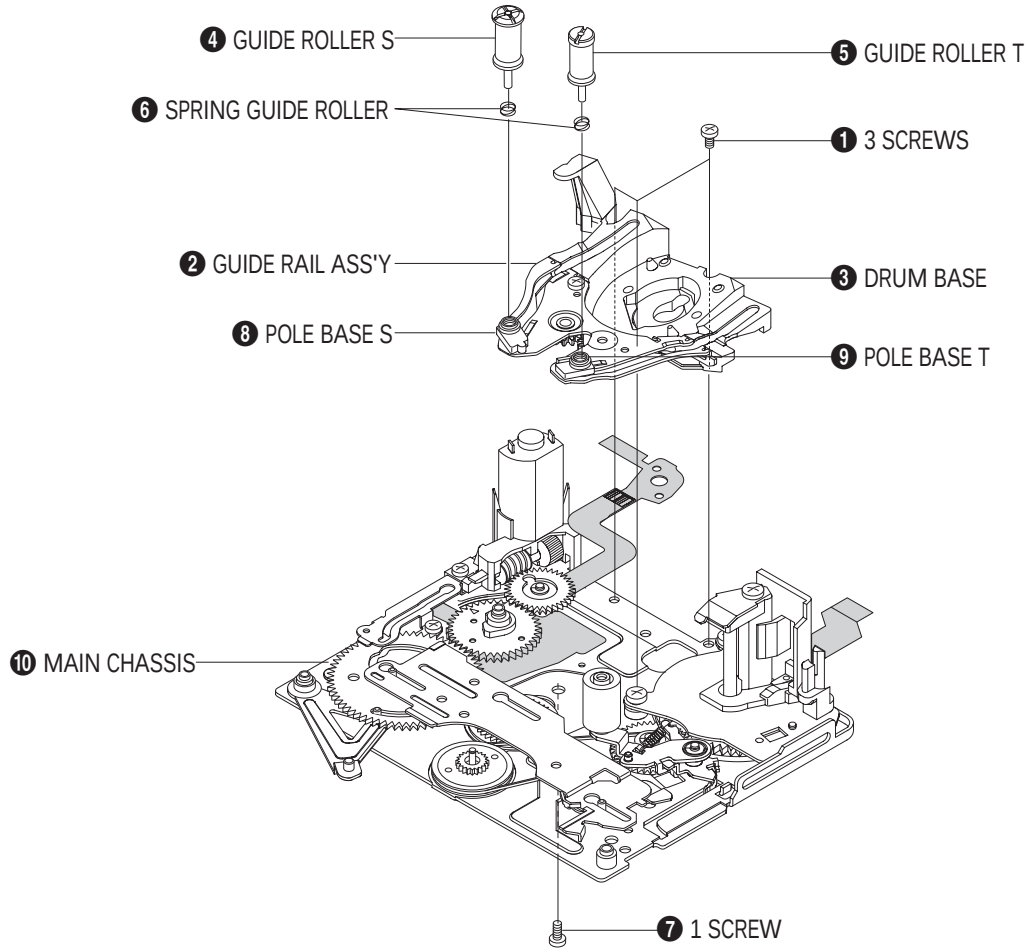


Fig 4-18 Guide Rail

4-2-9 Motor Loading, Guide Tension Cam, Gear Wheel

4-2-9(a) Disassembly

1) Eliminate pt welding 4 part ❹.
2) Remove the 1 screw ❷ and the 2 Hookes ❼, and then Lift up the Loading Ass'y ❶.
3) Remove the 1 screw, Lift up the Guide Tension cam ❹.
4) Remove the washer slit ❺, Lift up the Gear wheel ❻.

4-2-9(b) Reassembly

Reassemble in reverse order.

Note : Be careful not to touch the hand in the dew.

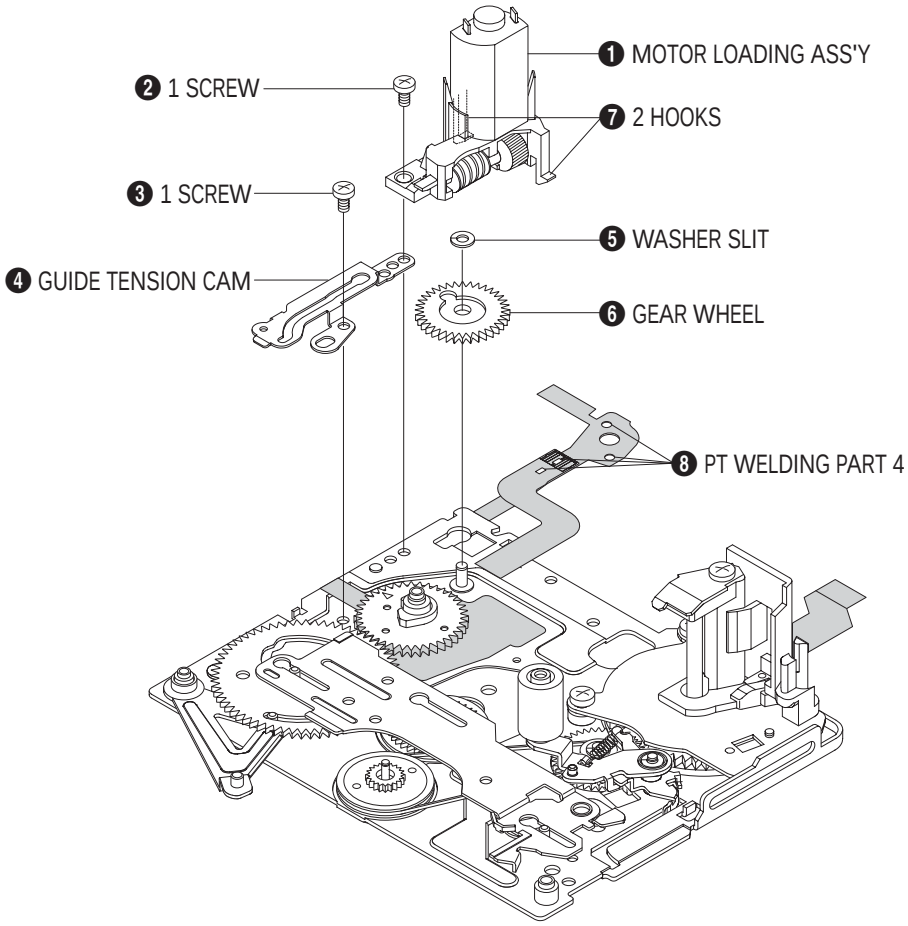


Fig. 4-19 Motor Loading, Guide Tension Cam, Gear Wheel

4-2-10 Motor Capstan, Holder FPC Sub, Arm Pinch Roller, Slide Main

4-2-10(a) Disassembly

Note 1 : When removing and reassembling, be careful not to giss the Gear Part.
Note 2 : When removing and reassembling, be careful not to touch the hand in the pinch Roller.(Protection contamination)

1) Remove the 1 screw ❶, lift up the Holder FPC Sub ❷.
2) Remove the 2 screws ❸, lift up the motor Capstan ❹.
3) Remove the washer slit ❺, separate the “A” part of spring Lever pinch ❻ to the spring hook of Arm pinch Roller ❼.
4) Lift up the Arm pinch Roller ❼.
5) Lift up the spring Lever pinch ❻.
6) Turn Gear cam main ❽ in the reverse direction of Arrow B to the End, and then lift the slide main ❾ in the direction of arrow D.

4-2-10(b) Reassembly

Reassembly in reverse order.

Note : When removing and reassembling, must be correspond to assemble point Gear cam main.

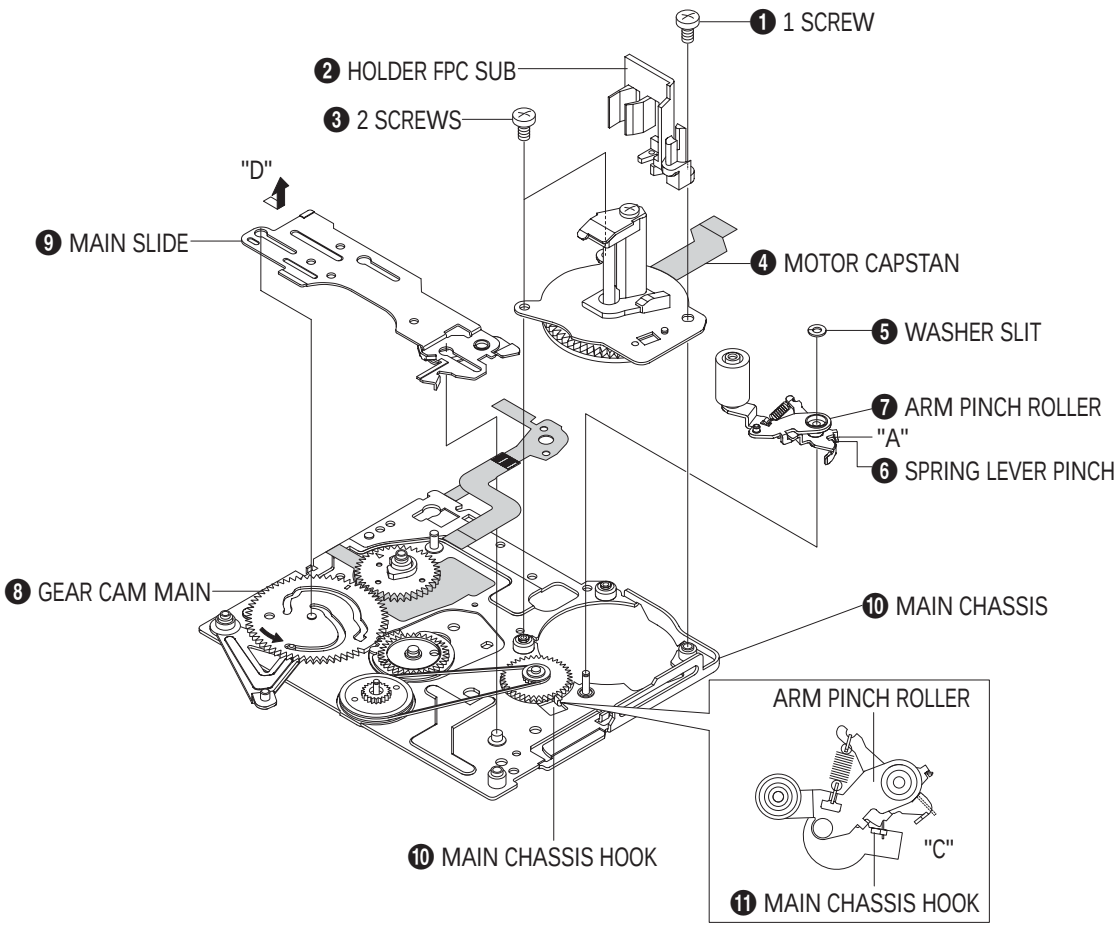


Fig. 4-20 Motor Capstan, Holder FPC Sub, Arm Pinch Roller, Slider Main

4-2-11 Gear Cam Main, Lever Cam, Gear Connector

4-2-11(a) Disassembly

1) After lift the Gear Cam Main ❶, and then lift up the Lever Cam ❷.
2) Lift the Gear Connector ❸.

4-2-11(b) Reassembly

1) Align the hole of the Gear Connector ❸ and the Main chassis hole with Timing(B) (HOLE).
2) Align the hole of the Lever Cam ❷ and the Main Chassis hole with Timming(A) (HOLE).
3) Align the hole of the Gear Cam Main ❶ and the Main Chassis hole with Timing(C) (HOLE).

Note : When reassemble the Gear Cam Main, assemble the Gear Mode switch to align with Detail “D”.

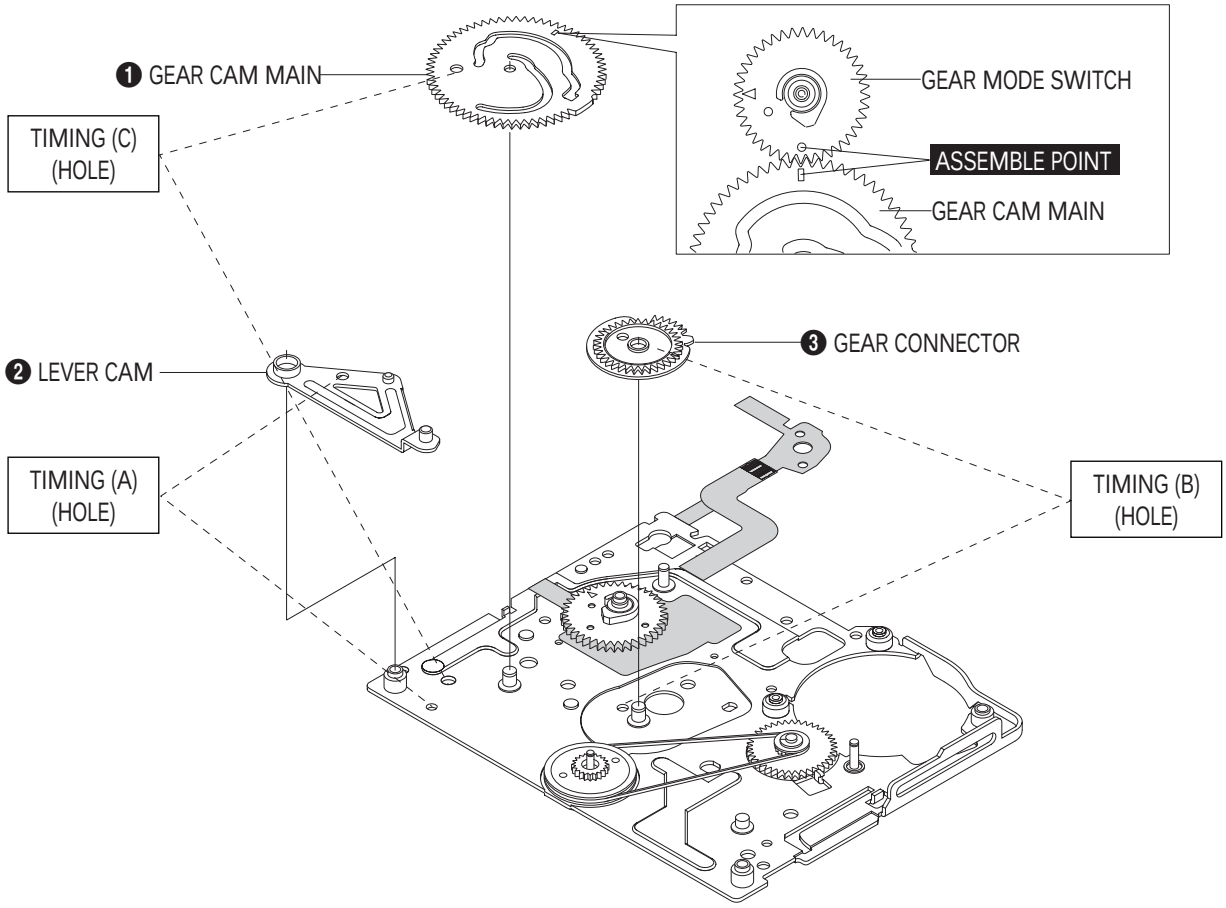


Fig. 4-21 Gear Cam Main, Lever Cam, Gear Connetor

4-2-12 Gear Pully, Belt Timing, Gear Capstan

4-2-12(a) Disassembly

1) Rmove the washer slit ❶, Lift the Gear Capstan ❷.
2) Separate the Belt Timing ❸, Lift the Gear pully ❹.

4-2-12(b) Reassembly

1) Mount the Gear Pully ❹ and hang the Belt Timing ❸ on the Gear Pully ❹.
2) Hang the Belt timing ❸ to the upper Gear of the Gear Capstan ❷ and mount the Gear Capstan ❷.
3) Assemble the washer slit ❶.

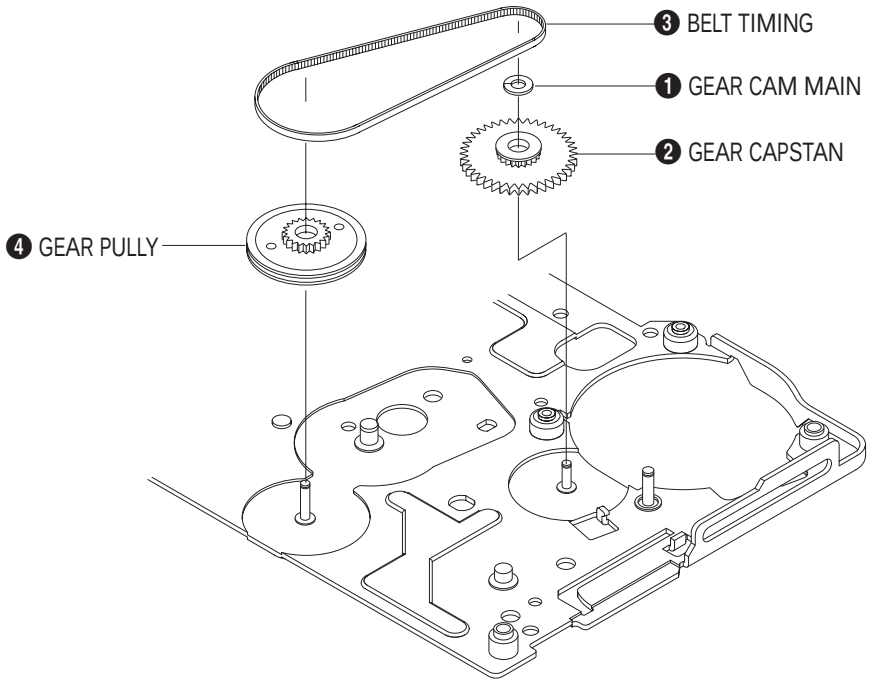


Fig. 4-22 Gear pully, Belt timing, Gear Capstan

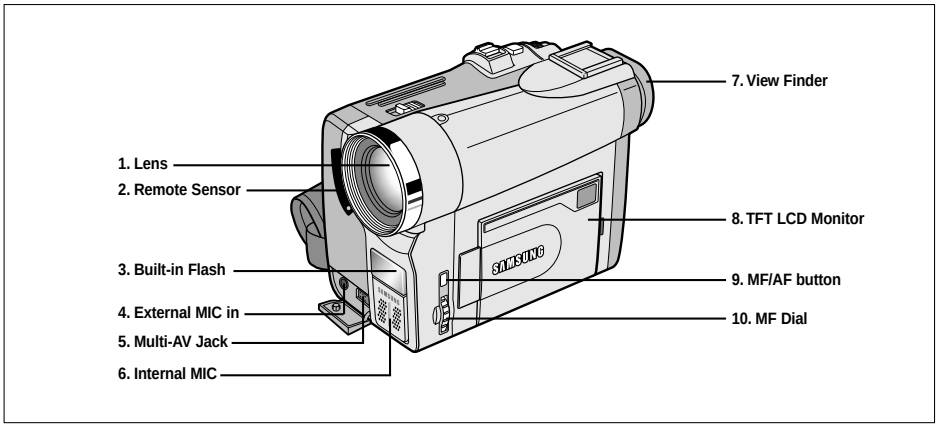
MEMO

3. Operating Instructions

ENGLISH

Getting to Know Your Camcorder

Front & Left View



1. Lens
2. Remote Sensor
3. Built-in Flash (see page 52)
4. External MIC in
5. Multi-AV Jack (see page 70)
6. Internal MIC
7. View Finder (see page 32)
8. TFT LCD Monitor (see page 31)
9. MF/AF button (see page 63)
10. MF Dial

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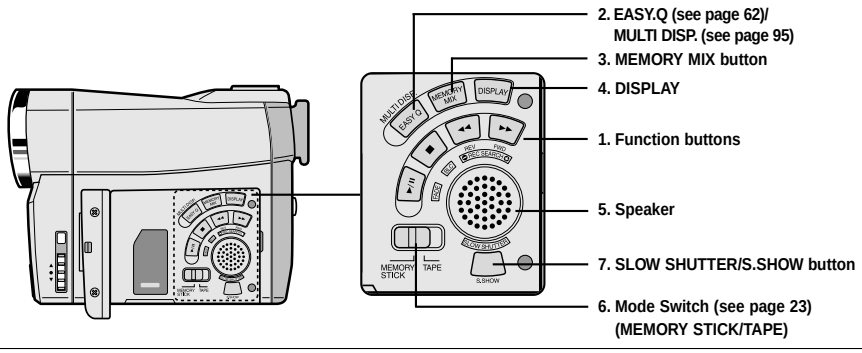
Getting to Know Your Camcorder

Left Side View



1. Function buttons

PLAYER	CAMERA	M.PLAY
▶/II : (PLAY/STILL)	FADE (see page 65)	▶/II : (MJPEG PLAY/STILL)
■ : (STOP)	BLC (see page 64)	-
◀◀ : (REW)	REC SEARCH –	REV (see page 94)
▶▶ : (FF)	REC SEARCH +	FWD (see page 94)

2. EASY.Q button (CAM) / MULTI DISP. (M.PLAY)
3. MEMORY MIX button (see page 50)
4. DISPLAY button (see page 19)
5. Speaker
6. Mode Switch (MEMORY STICK/TAPE)
7. SLOW SHUTTER (CAM) (see page 61) / S.SHOW (M.PLAY) (see page 95)

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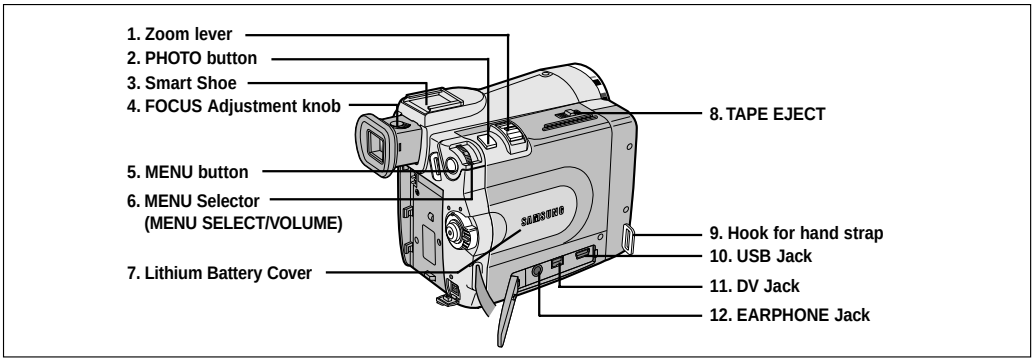
Getting to Know Your Camcorder

Right & Top View



1. Zoom lever (see page 45)
2. PHOTO button (see page 68)
3. Smart Shoe (see page 100)
4. FOCUS Adjustment knob (see page 32)
5. MENU button (see page 35)
6. MENU Selector (MENU SELECT/VOLUME) (see page 35)
7. Lithium Battery Cover (see page 21)
8. TAPE EJECT
9. Hook for hand strap
10. USB Jack (see page 78)
11. DV Jack (see page 76)
    DV out (VP-D93/D97/D99)
    DV in/out (VP-D93i/D97i/D99i)
12. EARPHONE Jack

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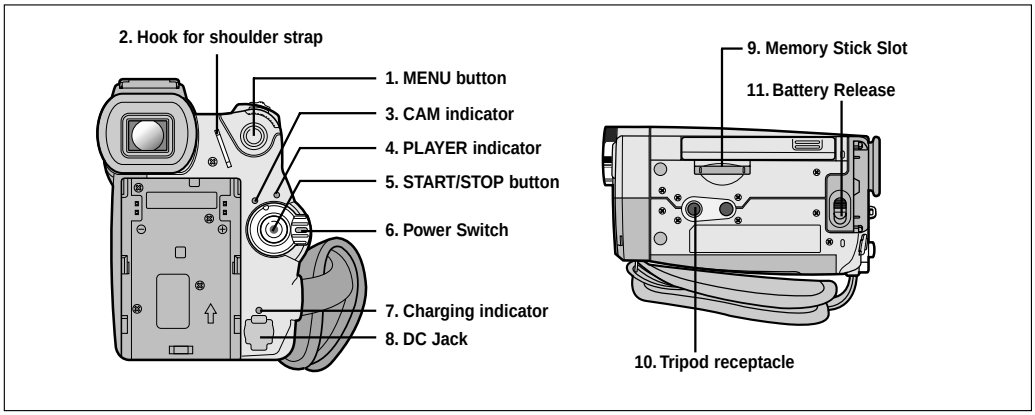
Getting to Know Your Camcorder

Rear & Bottom View



1. MENU button
2. Hook for shoulder strap
3. CAM indicator
4. PLAYER indicator
5. START/STOP button
6. Power Switch (see page 28)
7. Charging indicator
8. DC Jack (see page 23)
9. Memory Stick Slot (see page 82)
10. Tripod receptacle
11. Battery Release

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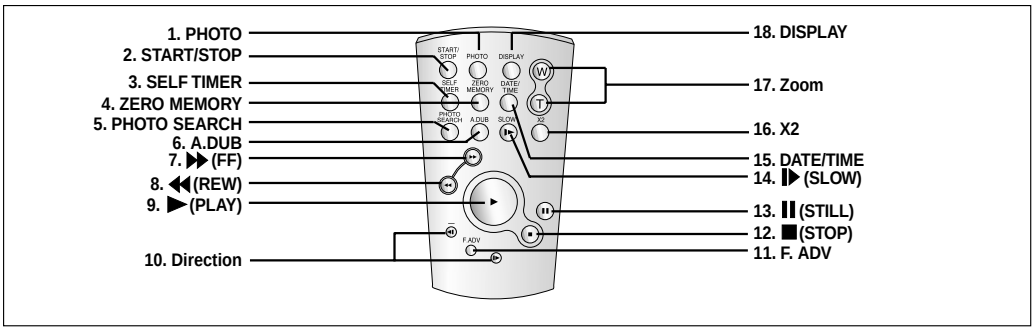
ENGLISH

Getting to Know Your Camcorder

Remote control



1. PHOTO
2. START/STOP
3. SELF TIMER (see page 20)
4. ZERO MEMORY (see page 74)
5. PHOTO Search (see page 68)
6. A.DUB (see page 66)
7. ▶▶ (FF)
8. ◀◀ (REW)
9. ▶ (PLAY)
10. Direction (◀▌▌ , ▌▌▶) (see page 72)
11. F. ADV (see page 73)
12. ■ (STOP)
13. ▌▌ (STILL)
14. ▌▶ (SLOW) (see page 73)
15. DATE/TIME
16. X2 (see page 73)
17. Zoom
18. Display

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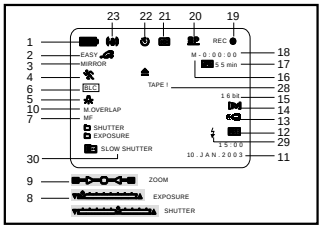
Getting to Know Your Camcorder

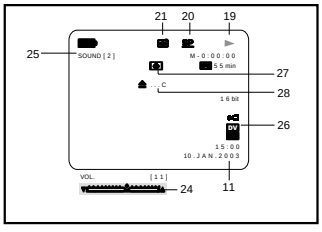
OSD (On Screen Display in CAM and PLAYER modes)

1. Battery level (see page 26)
2. Easy mode (see pages 62)
3. DSE (Digital Special Effects) mode (see page 48)
4. Program AE (see page 42)
5. White Balance mode (see page 44)
6. BLC (Back Light Compensation) (see page 64)
7. Manual focus (see page 63)
8. Shutter speed and EXPOSURE (see page 60)
9. Zoom position (see page 45)
10. Memory Mix (see page 50)
11. DATE/TIME (see page 56)
12. USB (see page 78)
13. WL. REMOTE (see page 38)
14. WIND CUT (see page 55)
15. Audio recording mode (see page 54)
16. Zero memory indicator (see page 74)
17. Remaining Tape (measured in minutes)
18. Tape Counter
19. Operating mode
20. Record speed mode
21. PHOTO mode
22. Self recording and waiting timer (see page 20)
23. EIS (see page 47)
24. Volume control (see page 34)
25. Audio playback channel (see page 67)
26. DV IN(DV data transfer mode) (VP-D93i/D97i/D99i only) (see page 77)
27. DEW (see page 7)
28. Message Line
29. FLASH mode (see page 52)
30. SLOW SHUTTER (see page 61)

OSD in CAM mode



OSD in PLAYER mode



ENGLISH

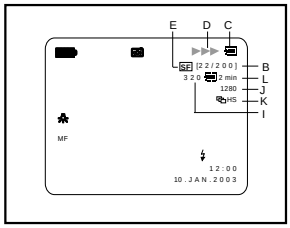
Getting to Know Your Camcorder

OSD (On Screen Display in M.REC/M.PLAY modes)

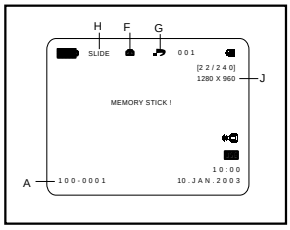
A. Folder number-file number (see page 83)
B. Image counter
- Current still image/Total number of recordable still images.

C. CARD (MEMORY STICK) indicator
D. Image recording and loading indicator
E. Photo Quality (see page 84)
F. ERASE PROTECTION indicator (see page 97)
G. Print Mark (see page 96)
H. SLIDE SHOW (see page 95)
I. MJPEG SCREEN SIZE (see page 86)
J. Image Size (see page 85)
K. Continuous Shot (see page 87)
L. Remaining Memory (MJPEG)

OSD in M.REC mode



OSD in M.PLAY mode



Turning the OSD on/off (On Screen Display)

• Turning OSD on/off

Press the DISPLAY button on the left side panel.
- Each press of the button toggles the OSD function on and off.
- When you turn the OSD off,
  In CAM mode: The STBY, REC, EASY.Q modes are always displayed on the OSD, even when the OSD is turned OFF and the key input is displayed for 3 seconds then turned off.
  In PLAYER mode: When you press any Function button, the function is displayed on the OSD for 3 seconds before it turns off.

• Turning the DATE/TIME on/off

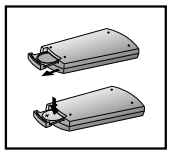
- The DATE/TIME is not affected when the OSD function is switched ON or OFF.
- To turn the DATE/TIME on or off, access the menu and change the DATE/TIME mode. (see page 56)
- You may also use the Quick Menu to turn the DATE/TIME ON or OFF. (see page 58) (only in CAM/M.REC mode)

ENGLISH

Preparation

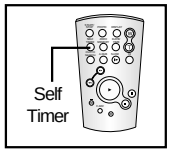
How to use the Remote Control

Battery Installation for the Remote Control



- You need to insert or replace the lithium battery when :
  - You purchase the camcorder.
  - The remote control doesn't work.
- Ensure that you insert the lithium cell correctly, following the + and - markings.
- Be careful not to reverse the polarity of the battery.

Self Record using the Remote Control



When you use the Self Timer function on the remote control, the recording begins automatically in 10 seconds.

1. Set the camcorder to CAM mode.
2. Press the SELF TIMER button until the appropriate indicator is displayed in the viewfinder.
3. Press the START/STOP button to start the timer.
   - Self Timer starts counting down from 10 with a beep sound.
   - In the last one second of the countdown, the beep sound gets faster, then recording starts automatically.
   - If you want to cancel the Self Timer function before recording, press the SELF TIMER button.
4. Press START/STOP again when you wish to stop recording.

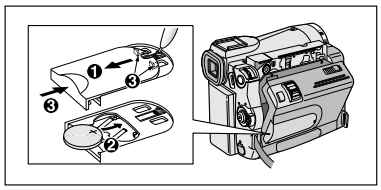
ENGLISH

Preparation

Lithium Battery Installation

- ✤ The lithium battery maintains the clock function and preset contents of the memory; even if the battery pack or AC power adapter is removed.
- ✤ The lithium battery for the camcorder lasts about 6 months under normal operation from the time of installation.
- ✤ When the lithium battery becomes weak or dead, the date/time indicator will display "---" when you set the DATE/TIME to ON. When this occurs, replace the lithium battery with CR2025 type.

1. While pressing the hole with a pen, open the lithium battery cover from the camcorder.
2. Insert the lithium battery with the ⊕ side facing upwards.
3. Slide the lithium battery cover in the direction of the arrow until it clicks.



Notes

- ■ The lithium battery must be inserted in the correct direction.
- ■ Do not pick up the battery using tweezers or other metal tools - this will cause a short circuit.
- ■ Do not recharge, disassemble, heat or immerse the battery in water, to avoid the risk of explosion.

Warning: Keep the LITHIUM BATTERY out of the reach of the children.
Should any battery be swallowed, consult a doctor immediately.

ENGLISH

Preparation

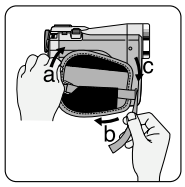
Adjusting the Hand Strap

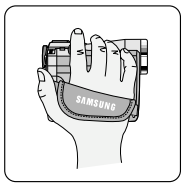
It is very important to ensure that the Hand strap has been correctly adjusted before you begin your recording.
The hand strap enables you to :

- Hold the camcorder in a stable, comfortable position.
- Press the Zoom and START/STOP button without having to change the position of your hand.

Hand strap

a. Pull open the Hand Strap cover and release the Hand Strap.
b. Adjust its length and stick it back onto the Hand Strap cover.
c. Close the Hand Strap cover again.

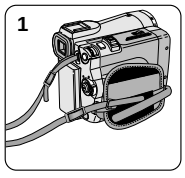


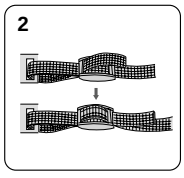


Shoulder Strap

The Shoulder Strap enables you to carry your camcorder around in complete safety.

1. Insert the end of strap into the Shoulder Strap hook on the camcorder. Insert the other end of strap into ring inside hand strap.
2. Thread each end into the buckle, adjust the length of the strap and then pull it tight in the buckle.





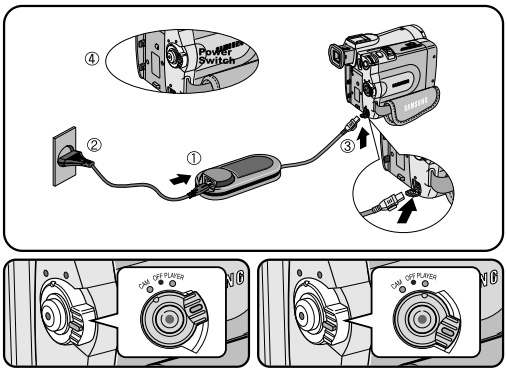
ENGLISH

Preparation

Connecting a Power Source

There are two types of power source that can be connected to your camcorder.
- The AC Power Adapter and AC cord : used for indoor recording.
- The Battery Pack : used for outdoor recording.

To use the AC Power adapter and DC Cable



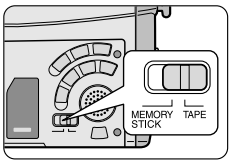
1. Connect the AC Power adapter to the AC cord.
2. Connect the AC cord to a wall socket.

Note

■ The plug and wall socket type may differ according to your resident country.

3. Connect the DC cable to the DC jack socket of the camcorder.
   (When the battery is attached on the set, you should keep outside the projection of the DC cable.)
4. Set the camcorder to each mode by holding down the tab on the power switch and turning it to the CAM or PLAYER mode.

To select the CAMCORDER mode



❖ If you want to use this unit as a camcorder, set the mode switch to TAPE position.
❖ If you want to use this unit as a DSC (Digital Still Camera), set the mode switch to MEMORY STICK position.

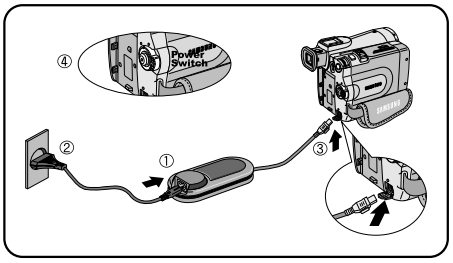
ENGLISH

Preparation

Using the Lithium Ion Battery Pack

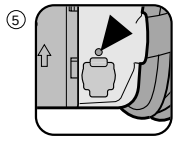
❖ The amount of continuous recording time available depends on :
- The type and capacity of the battery pack you are using.
- How often the Zoom function is used.
  It is recommended that you have several batteries available.

Charging the Lithium Ion Battery Pack



1. Attach the battery pack to the camcorder.
2. Connect the AC Power adapter to an AC cord and connect the AC cord to a wall socket.
3. Connect the DC cable to the DC jack socket on the camcorder.
4. Turn the Camera power switch to off, and the charging indicator will start to flash, showing that the battery is charging.

Blinking time	Charging rate
Once per second	Less than 50%
Twice per second	50% ~ 75%
Three times per second	75% ~ 90%
Blinking stops and stays on	90 ~ 100%
On for a second and off for a second	Error - Reset the battery pack and the DC cable



5. When the battery is fully charged, disconnect the battery pack and the AC Power adapter from the camcorder.
   ■ Even with the power switched off, the battery pack will still discharge if it is left connected to the camcorder.

Notes

■ The battery pack may be charged a little at the time of purchase.
■ To prevent reduction in the life and capacity of the battery pack, always remove it from the camcorder after it is fully charged.

ENGLISH

Preparation

Using the Lithium Ion Battery Pack

Table of continuous recording time based on model and battery type.

- ✤ If you close the LCD screen, it switches off and the viewfinder switches on automatically.
- ✤ The continuous recording times given in the table above are approximations.
  Actual recording time depends on usage.

Time / Battery	Charging time	Continuous recording time	
		LCD ON	Viewfinder ON
SB-L110	Approx. 1hr 40min	Approx. 1hr 20min	Approx. 2hr
SB-L220	Approx. 3hr 30min	Approx. 3hr	Approx. 4hr 10min

Notes

- The battery pack should be recharged in an environment of between 32°F (0°C) and 104°F (40°C).
- The battery pack should never be charged in a room temperature that is below 32°F (0°C).
- The life and capacity of the battery pack will be reduced if it is used in temperatures below 32°F (0°C) or left in temperatures above 104°F (40°C) for a long period, even when it is fully recharged.
- Do not put the battery pack near any heat source (fire or flames, for example).
- Do not disassemble, process, pressure, or heat the Battery Pack.
- Do not allow the + and - terminals of the battery pack to be short-circuited.
  It may cause leakage, heat generation, induce fire and overheating.
- When using SB-L220 Battery, use of Viewfinder is inconvenience. use of LCD Monitor is encouraged.

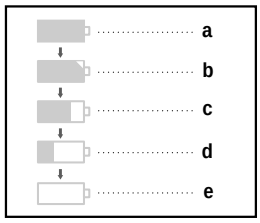
ENGLISH

Preparation

Battery level display

- **The battery level display indicates the amount of power remaining in the battery pack.**

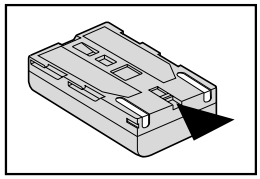
a. Fully charged
b. 20~40% used
c. 40~80% used
d. 80~95% used
e. Completely used (flickers)
(The camcorder will turn off soon, change the battery as soon as possible)



- ✤ Please refer to the table on page 25 for approximate continuous recording times.
- ✤ The recording time is affected by environmental temperature and conditions.
  The recording time becomes very short in a cold environment.
  The continuous recording times in the operating instructions are measured using a fully charged battery pack at 77°F(25°C).
  As the environmental temperature and conditions may differ when you actually use the camcorder, the remaining battery time may not be the same as the approximate continuous recording times given in these instructions.

Tips for Battery Identification

A charge mark is provided on the battery pack to help you remember whether it has been charged or not.
Two colours are provided (red and grey)-you may choose which one indicates charged and which indicates discharged.

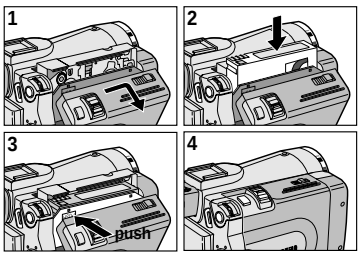


ENGLISH

Preparation

Inserting and Ejecting a Cassette

✤ When inserting a tape or closing a cassette holder, do not apply excessive force. This may cause a malfunction.
✤ Do not use any tapes other than Mini DV cassettes.



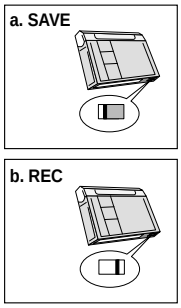
1. Connect a power source and slide the TAPE EJECT switch and open the cassette door.
   - The cassette holding mechanism rises automatically.
2. Insert a tape into the cassette holder with the tape window facing outward and the protection tab toward the top.
3. Press the area labelled PUSH on the cassette holding mechanism until it clicks into place.
   - The cassette is loaded automatically.
4. Close the cassette door.
   - Close the door completely until you can hear a “click”.

Note

When you have recorded something that you wish to keep, you can protect it so that it will not be accidentally erased.

a. Protecting a tape :
Push the safety tab on the cassette so that the hole is uncovered.

b. Removing the tape protection :
If you no longer wish to keep the recording on the cassette, push the write-protect tab back so that it covers the hole.



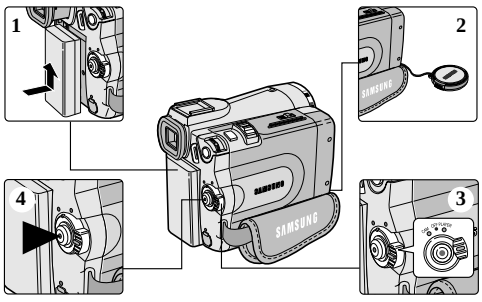
• **How to store a tape**

a. Avoid places with magnets or magnetic interference.
b. Avoid humidity and dust prone places.
c. Keep the tape in an upright position and avoid storing it in direct sunlight.
d. Avoid dropping or knocking your tapes.

ENGLISH

Basic Recording

Making your First Recording



1. Connect a Power source to the camcorder. (see page 23)
   (A battery pack or a AC power adapter)
   ■ Insert a cassette. (see page 27)

2. Remove the LENS CAP.

3. Set the power switch to the CAM position.
   ■ Open the LCD monitor.
   ■ Set the mode switch to the TAPE position.
   Make sure that STBY is displayed.
   ■ If the protection tab of the cassette is open, STOP and PROTECTION! will be displayed.
   ■ Make sure the image you want to record appears in the LCD monitor or viewfinder.
   ■ Make sure the battery level indicates that there is enough remaining power for your expected recording time.

4. To start recording, press the START/STOP button.
   ■ REC is displayed in the LCD.
   To stop recording, press the START/STOP button again.
   ■ STBY is displayed in the LCD.

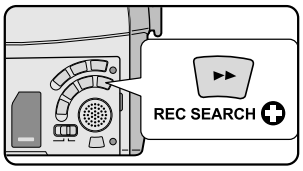
ENGLISH

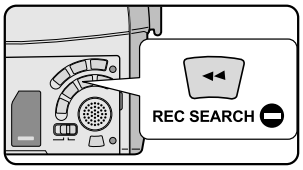
Basic Recording

When a cassette is loaded and the camcorder is left in the STBY mode for more than 5 minutes without being used, it will switch off automatically.
To use it again, push the START/STOP button or set the Power switch to OFF and then back to CAM.
This Auto Power off feature is designed to save battery power.

Record Search (REC SEARCH)

- You can view a recording using the REC SEARCH +, – function in STBY mode.
  REC SEARCH – enables you to play the recording backwards and
  REC SEARCH + enables you to play it forwards, for as long as you keep each button pressed down.
- If you press the REC SEARCH – button in STBY mode, your camcorder will play in reverse for 3 seconds and return to the original position automatically.





Note

Mosaic shaped distortion may appear on the screen while in Record Search mode.

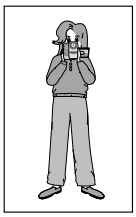
ENGLISH

Basic Recording

Hints for Stable Image Recording

- While recording, it is very important to hold the camcorder correctly.
- Fix the LENS cap firmly by clipping it to the hand strap. (refer to the figure)

Recording with the LCD monitor



1. Hold the camcorder firmly using the hand strap.
2. Place your right elbow against your side.
3. Place your left hand under or beside the LCD to support and adjust it.
   Do not touch the built-in microphone.
4. Choose a comfortable, stable position for the shots that you are taking.
   You can lean against a wall or on a table for greater stability.
   Do not forget to breathe gently.
5. Use the LCD frame as a guide to determine the horizontal plane.
6. Whenever possible, use a tripod.

Recording with the Viewfinder

1. Hold the camcorder firmly using the hand strap.
2. Place your right elbow against your side.
3. Place your left hand under the camcorder to support it.
   Be sure not to touch the built-in microphone.
4. Choose a comfortable, stable position for the shots that you are taking.
   You can lean against a wall or on a table for greater stability.
   Do not forget to breathe gently.
5. To view an object through the viewfinder, pull it out until you hear the 'click' sound.
   Excessive force may cause damage to the viewfinder.
6. Place your eye firmly against the viewfinder eyecup.
7. Use the viewfinder frame as a guide to determine the horizontal plane.
8. Whenever possible, use a tripod.

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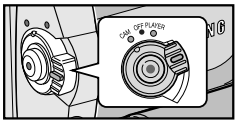
Basic Recording

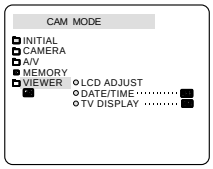
Adjusting the LCD

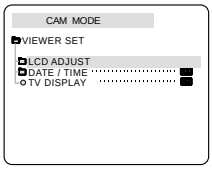
- ✤ Your camcorder is equipped with a 2.5 inch colour Liquid Crystal Display(LCD) screen, which enables you to view what you are recording or playing back directly.
- ✤ Depending on the conditions under which you are using the camcorder (indoors or outdoors for example), you can adjust ;
  - ■ BRIGHT SELECT
  - ■ BRIGHT ADJUST
  - ■ COLOUR ADJUST

1. Set the POWER switch to CAM position.
   - ■ In the PLAYER mode, you may only setup the LCD while the tape is playing.

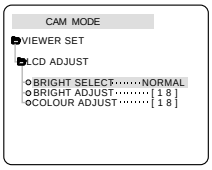


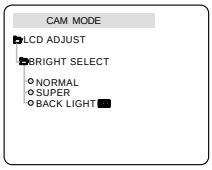
2. Open the LCD screen, and the LCD switches on.
3. Press the MENU button.
4. Move the MENU SELECTOR so that VIEWER is highlighted and then push the MENU SELECTOR.
5. Move the MENU SELECTOR so that LCD ADJUST is highlighted.
6. Push the MENU SELECTOR to enter the sub-menu.
7. Move the MENU SELECTOR so that it highlights the menu item you want to adjust (BRIGHT SELECT, BRIGHT ADJUST, COLOUR ADJUST).





*VP-D99(i) only





ENGLISH

Basic Recording

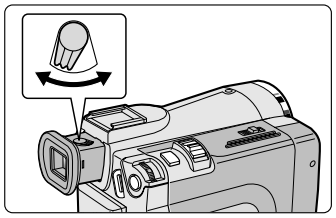
8. Push the MENU SELECTOR button again.
   - ■ You may select NORMAL, SUPER or BACK LIGHT OFF (VP-D99(i) only) in the BRIGHT SELECT feature and push the MENU SELECTOR to save the setting.
     - When you use the LCD BACK LIGHT OFF mode in a dark location or indoors, viewing the image may be difficult. (VP-D99(i) only).
   - ■ Use the MENU SELECTOR to adjust the value of BRIGHT ADJUST and COLOUR ADJUST.
   - ■ You can set values for BRIGHT ADJUST between 00 ~ 35 and COLOUR ADJUST between 00 ~ 35.
9. Press the MENU button to finish the setting.

Using the VIEWFINDER

- ✤ The VIEWFINDER will not work when the LCD is open.
- ✤ In order to bring it into focus, pull the viewfinder forward until you here a click.

Adjusting the Focus

Use the focus adjustment knob of the VIEWFINDER to focus the picture.
(refer to figure)



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Basic Recording

Playing back a tape you have recorded on the LCD

- ✤ You can monitor the playback picture on the LCD monitor.
- ✤ Make sure that the battery pack is in place.

1. Set the mode switch to TAPE.

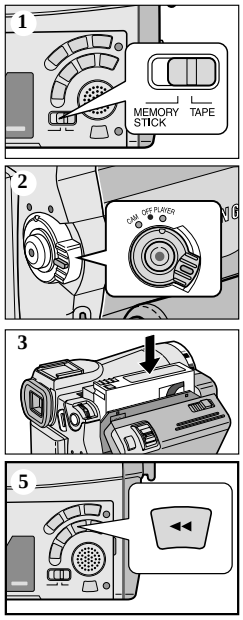
2. Hold down the power switch tab and turn it to the PLAYER position.
   - ■ A confirmation sound beeps.

3. Insert the tape you wish to view. (see page 27)

4. Open the LCD screen.
   Adjust the angle of the LCD screen and set the brightness or colour if necessary.

5. Press the ◀◀ (REW) button to rewind the tape to the starting point.
   - ■ To stop rewinding, press the ■ (STOP) button.
   - ■ The camcorder stops automatically after rewinding is complete.

6. Press the ▶/II (PLAY/STILL) button to start playback.
   - ■ You can view the picture you recorded on the LCD.
   - ■ To stop the PLAY operation, press the ■ (STOP) button.



Notes

- ■ You can also view the picture on a TV screen, after connecting the camcorder to a TV or VCR. (see page 70)
- ■ Various functions are available in playback mode. (see page 72)

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Basic Recording

Adjusting the LCD during PLAY

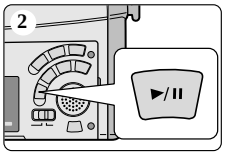
- ✤ You can adjust the LCD during playback.
- ✤ The adjustment method is the same procedure as used in CAM mode. (see page 31)

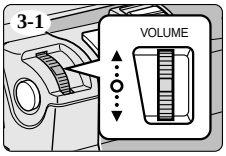
Controlling Sound from the Speaker

The Speaker works in PLAYER mode only.

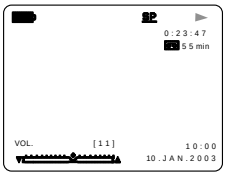
- ■ When you use the LCD screen for playback, you can hear recorded sound from the built-in Speaker.
  - Follow the instructions below to decrease or mute speaker volume in the PLAYER mode.
  - Take the following steps to lower the volume or mute the sound while playing a tape on the camcorder.

1. Set the power switch to PLAYER mode.
2. Press ▶/II (PLAY/STILL) to play the tape.
3. When you hear sounds once the tape is in play, use the MENU SELECTOR to adjust the volume.
   - ■ A volume level display will appear on the LCD.
     Levels may be adjusted from anywhere between 00 to 19 and you will not hear any sound when the volume is set on 00.
   - ■ If you close the LCD while playing, you will not hear sound from the speaker.





<3-2>



Notes

- ■ When the cable is connected to the Multi AV jack, you cannot hear sound from the speaker and cannot adjust the volume.
- ■ If a cable is connected to the Multi AV jack, you can hear sound from the speaker when AV IN/OUT MODE on MENU is set to AV IN or S-VIDEO IN. (VP-D93i/D97i/D99i only)
- ■ You can hear sound from speaker by removing the connected cable from the Multi AV jack.
- ■ The speaker turns off when you use earphones.

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Advanced Recording

Use of various Functions

● **Setting menu items**

MENU	SUB MENU	Available mode			
		CAMERA	PLAYER	Memory REC.	Memory PLAY
INITIAL	CLOCK SET	✔	✔	✔	✔
	WL.REMOTE	✔	✔	✔	✔
	BEEP SOUND	✔	✔	✔	✔
	SHUTTER SOUND		✔	✔	
	DEMONSTRATION	✔			
CAMERA	PROGRAM AE	✔			
	WHT. BALANCE	✔		✔	
	D. ZOOM	✔			
	EIS	✔			
	DSE SELECT	✔			
	MEMORY MIX	✔			
	FLASH SELECT	✔		✔	
A/V	REC MODE	✔	✔		
	PHOTO SEARCH		✔		
	PHOTO COPY		✔		
	AUDIO MODE	✔	✔		
	AUDIO SELECT		✔		
	WIND CUT	✔	✔		
	AV IN/OUT (VP-D93i/D97i/D99i only)		✔		
MEMORY	PHOTO QUALITY		✔	✔	
	IMAGE SIZE		✔	✔	
	MJPEG SIZE		✔	✔	
	CONTINUOUS SHOT			✔	
	PRINT MARK				✔
	PROTECT				✔
	FILE NO.		✔	✔	✔
	DELETE				✔
	FORMAT				✔
VIEWER	LCD ADJUST	✔	✔	✔	✔
	DATE/TIME	✔	✔	✔	✔
	TV DISPLAY	✔	✔	✔	✔

● **Set the camcorder to CAM or PLAYER mode and M.REC or M.PLAY mode**

1. Press the MENU button.
   The MENU OSD is displayed. The cursor (HIGHLIGHT) indicates the feature you are currently adjusting.
2. Use the MENU SELECTOR and push the MENU SELECTOR on the left side panel to select and activate the item.
3. You can exit the menu mode by pressing the MENU button.

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Advanced Recording

● **Availability of functions in each mode**

Requested Mode / Operating Mode	Digital functions				Digital special effects
	EIS	D.ZOOM	PHOTO (TAPE)	SLOW SHUTTER	
EIS		O	O	△	O
D.ZOOM	O		O	* △	O
PHOTO	×	×		×	×
SLOW SHUTTER	△	×	O		O
Digital Special Effects	O	O	O	O	

O : The requested mode will work in this operating mode.
× : You can not change the requested mode.
△ : The operating mode will be released and the requested mode will work.
* : The operating mode will be released and the requested mode will work.
(the data during the operating mode will be backed up)

Notes

- When a menu item on the LCD is marked with an ☒, that item cannot be activated.
- When you select an item that cannot be changed, an error message will be displayed.

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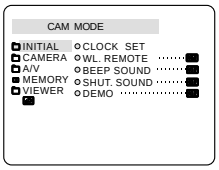
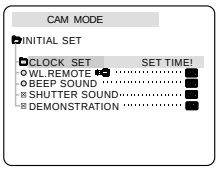
Advanced Recording

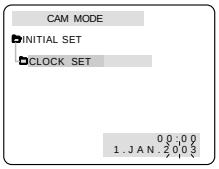
● CLOCK SET

- ✤ CLOCK setup works in CAM, PLAYER, M.REC and M.PLAY modes.
- ✤ The DATE/TIME is automatically recorded onto a tape.
  Before recording, please set the DATE/TIME.

1. Press the MENU button.
   - ■ The menu list will appear.
2. Move the MENU SELECTOR to highlight INITIAL and push the MENU SELECTOR.
3. Use the MENU SELECTOR to select CLOCK SET from the submenu.
4. Push the MENU SELECTOR to enter SETTING mode.
   - ■ A blinking item indicates the item to be changed. The year will blink first.
5. Using the MENU SELECTOR, change the year setting.
6. Push the MENU SELECTOR.
   - ■ The month will blink.
7. Using the MENU SELECTOR, change the month setting.
8. Push the MENU SELECTOR.
   - ■ The day will blink.
9. You can set the day, hour and minute following the same procedure for setting the year and month.
10. Push the MENU SELECTOR after setting the minutes.
    - ■ The word COMPLETE! will appear, and a few seconds later, the menu screen will automatically return to the sub menu.
11. To exit, push the MENU button.







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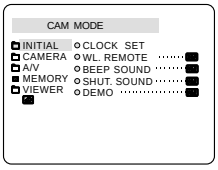
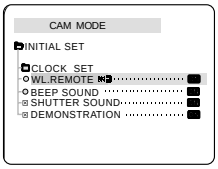
Advanced Recording

● WL. REMOTE

- ✤ The WL.REMOTE function works in CAM, PLAYER, M.REC, M.PLAY modes.
- ✤ The WL.REMOTE option allows you to enable or disable the remote control for use with the camcorder.

1. Press the MENU button.
   - ■ The menu list will appear.
2. Move the MENU SELECTOR to highlight INITIAL and push the MENU SELECTOR.
3. Use the MENU SELECTOR to select WL.REMOTE from the submenu.
4. Push the MENU SELECTOR to enable or disable the remote control.
   The setting switches between ON/OFF each time you push the MENU SELECTOR.
5. To exit, press the MENU button.
   - ■ If you set the remote to OFF in the menu and try to use it, the remote icon will blink for 3 seconds and disappear on the LCD.





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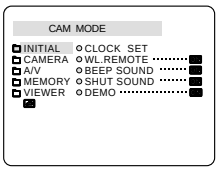
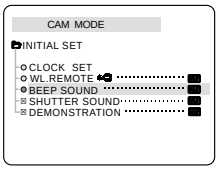
Advanced Recording

● **BEEP SOUND**

- ✤ The BEEP SOUND function works in CAM, PLAYER, M.REC, M.PLAY modes.
- ✤ Use the MENU to setup the BEEP SOUND function.
  Select whether or not you want to hear a beep sound whenever you change a setup value.

1. Press the MENU button.
   - ■ The menu list will appear.
2. Move the MENU SELECTOR to highlight INITIAL and push the MENU SELECTOR.
3. Use the MENU SELECTOR to select BEEP SOUND from the submenu.
4. Push the MENU SELECTOR to enable or disable the BEEP SOUND.
   The setting switches between ON/OFF each time you push the MENU SELECTOR.
   - ■ You will hear a Beep Sound when you select the ON setup.
   - ■ When you press the START/STOP button to start recording, the BEEP SOUND is automatically set to OFF so you can't hear it any longer.
5. To exit, press the MENU button.





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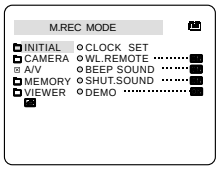
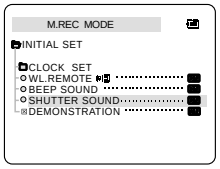
Advanced Recording

● **SHUTTER SOUND**

- ✤ You can hear SHUTTER SOUND only when the PHOTO function is working.
- ✤ Determines whether or not you wish to hear a SHUTTER SOUND when using the DSC feature.

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to CAM mode.
3. Press the MENU button.
   - ■ The menu list will appear.
4. Move the MENU SELECTOR to highlight INITIAL and push the MENU SELECTOR.
5. Use the MENU SELECTOR to select SHUTTER SOUND from the submenu.
6. Push MENU SELECTOR to switch between ON and OFF.
7. To exit, press the MENU button.





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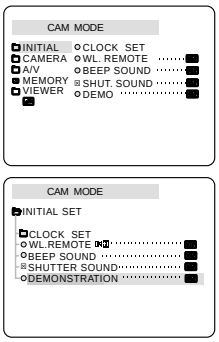
Advanced Recording

● DEMONSTRATION

- ✤ Demonstration automatically shows you the major functions that are included with your camcorder so that you may use them more easily.
- ✤ The DEMONSTRATION function may only be used in the CAM mode without a tape inserted in the camcorder.
- ✤ The demonstration operates repeatedly until the DEMONSTRATION mode switched OFF.

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - ■ The menu list will appear.
3. Move the MENU SELECTOR to highlight INITIAL.
4. Select DEMONSTRATION from the submenu and push the MENU SELECTOR.
5. To activate the DEMONSTRATION, set DEMONSTRATION ON.
   - ■ Press the menu button to quit the menu.
   - ■ The demonstration will begin.
6. To end the DEMONSTRATION, set the DEMONSTRATION to OFF.



Notes

- ■ The DEMONSTRATION function only works without a TAPE installed.
- ■ The DEMONSTRATION mode is automatically activated when the camcorder is left idle for more than 10 minutes after switching to the CAM mode (no tape is inserted in the camcorder).
- ■ If you press other buttons (FADE, BLC, PHOTO, EASY) during the DEMONSTRATION mode, the DEMONSTRATION stops temporarily and resumes 10 minutes later if you do not operate any other functions.

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Advanced Recording

● PROGRAM AE

- ✤ The PROGRAM AE function works in CAM mode only.
- ✤ The PROGRAM AE mode allows you to adjust shutter speeds and apertures to suit different recording conditions.
- ✤ They give you creative control over the depth of field.

■ AUTO mode

- Auto balance between the subject and the background.
- To be used in normal conditions.
- The shutter speed automatically varies from 1/50 to 1/250 per second, depending on the scene.

■ SPORTS mode ( )

- For recording people or objects moving quickly.

■ PORTRAIT mode ( )

- For focusing on the background of the subject, when the background is out of focus.
- The PORTRAIT mode is most effective when used outdoors.
- The shutter speed automatically varies from 1/50 to 1/1000 per second.

■ SPOTLIGHT mode ( )

- For recording correctly when there is only light on the subject and not the rest of the picture.

■ SAND/SNOW mode ( )

- For recording when people or objects are darker than the background because of reflected light from sand or snow.

■ High S. SPEED(High Shutter Speed) mode ( )

- For recording fast-moving subjects such as players in golf or tennis games.

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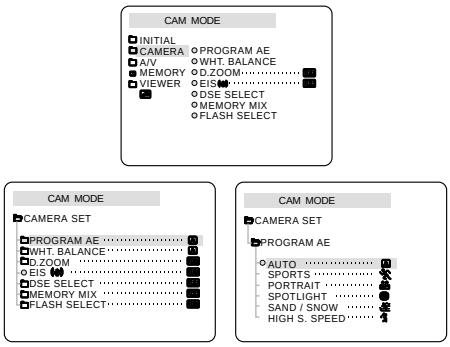
Advanced Recording

Setting the PROGRAM AE

1. Press the MENU button.
   - The menu list will appear.
2. Move the MENU SELECTOR to highlight CAMERA and push the MENU SELECTOR.
3. Select PROGRAM AE from the submenu.
4. Push the MENU SELECTOR to enter the sub-menu.
5. Using the MENU SELECTOR, select the PROGRAM AE mode.
   - Push the MENU SELECTOR to confirm the PROGRAM AE mode.
6. To exit, press the MENU button.



Notes

- The P.AE function will not operate in EASY mode.
- When recording with a PROGRAM AE mode, the Flash function and Video Light Auto function (optional) do not work.

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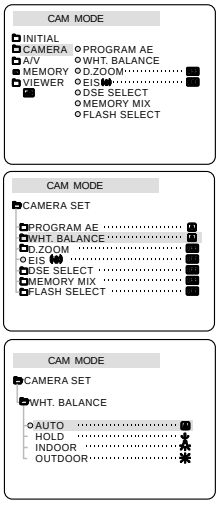
Advanced Recording

● WHT. BALANCE (WHITE BALANCE)

- ✤ The WHITE BALANCE function works in CAM or M.REC mode only.
- ✤ The WHITE BALANCE is a recording function that preserves the unique image colour of the object in any recording condition.
- ✤ You may select the appropriate WHITE BALANCE mode to obtain good quality image colour.
  - AUTO (A) : This mode is generally used to control the WHITE BALANCE automatically.
  - HOLD ( ) :This fixes the current WHITE BALANCE value.
  - INDOOR ( ) : This controls the WHITE BALANCE according to the indoor ambience.
    - Under halogen or studio/video lighting
    - Subject is of one dominant colour
    - Close ups
  - OUTDOOR (✱) : This controls the WHITE BALANCE according to the outdoor ambience.
    - In daylight, especially for close ups and where the subject is of one dominant colour.

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - The menu list will appear.
3. Move the MENU SELECTOR to highlight CAMERA and push the MENU SELECTOR.
4. Select WHT.BALANCE from the submenu.
5. Push the MENU SELECTOR to enter the sub-menu.
6. Using the MENU SELECTOR, select the WHITE BALANCE mode.
   - Push the MENU SELECTOR to confirm the WHITE BALANCE mode.
7. To exit, press the MENU button.



Notes

- The WHT.BALANCE function will not operate in EASY mode.
- Turn the digital zoom off (if necessary) to set a more accurate white balance.
- Reset the white balance if lighting conditions change.
- During normal outdoor recording, setting to AUTO may provide better results.

ENGLISH

Advanced Recording

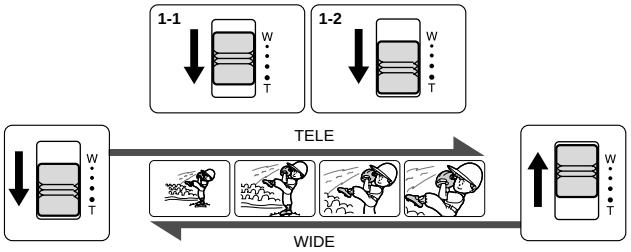
Zooming In and Out with DIGITAL ZOOM

- ✤ Digital Zoom works in CAM mode only.

Zooming In and Out

- ✤ Zooming is a recording technique that lets you change the size of the subject in a scene. For more professional looking recordings, do not use the zoom function too often.
- ✤ You can zoom using variable zoom speeds.
- ✤ Use these features for different shots. Please note that over-use of the zoom feature can lead to unprofessional looking results and a reduction of battery usage time.

1. Move the zoom lever slightly for a gradual zoom, move it further for a high-speed zoom. Your zooming is monitored on the OSD.
2. T(Telephoto) side: Subject appears closer.
3. W(Wide angle) side: Subject appears farther away.



Note

You can record a subject that is a minimum of 1 m (about 3.2 feet) away from the lens surface in the TELE position, or about 10 mm (about 0.5 inch) away in the WIDE position.

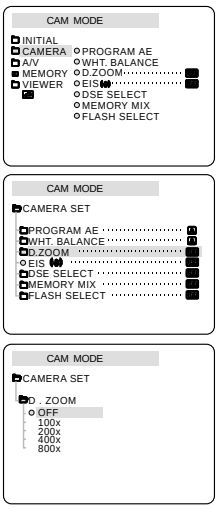
ENGLISH

Advanced Recording

Digital Zoom

- ✤ Zooming more than 12x is achieved digitally.
- ✤ The picture quality may deteriorate depending on how much you zoom in on the subject.
- ✤ We recommend that you use the EIS feature with DIGITAL ZOOM for picture stability. (see page 47)

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - ■ The menu list will appear.
3. Move the MENU SELECTOR to CAMERA and push the MENU SELECTOR.
4. Select D.ZOOM from the submenu.
5. Push the MENU SELECTOR to setup the 100x, 200x, 400x, 800x digital zoom function or to turn the feature OFF.
6. To exit, press the MENU button.



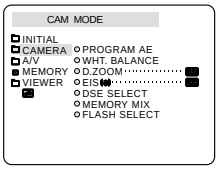
ENGLISH

Advanced Recording

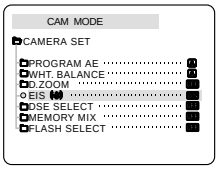
● EIS (Electronic Image Stabilizer)

- ✤ The EIS function works in CAM mode only.
- ✤ EIS (Electronic Image Stabilizer) is a function that compensates for any shaking or hand movement while holding the camcorder (within reasonable limits).
- ✤ It provides more stable pictures when:
  - ■ Recording with the zoom
  - ■ Recording a small object close-up
  - ■ Recording and walking at the same time
  - ■ Recording through the window of a vehicle

1. Set the camcorder to CAM mode.



2. Press the MENU button.
   - ■ The menu list will appear.
3. Move the MENU SELECTOR highlight to CAMERA and push the MENU SELECTOR.
   - ■ The sub menu list will appear.
4. Move the MENU SELECTOR to activate the EIS function, push the MENU SELECTOR.
   - ■ The EIS menu is changed to ON.
   - ■ If you do not want to use the EIS function, set the EIS menu to OFF.
5. To exit, press the MENU button.



Notes

- ■ It is recommended that you deactivate the shake compensation function when using a tripod.
- ■ If you use the EIS function, the picture quality may deteriorate

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ENGLISH

Advanced Recording

● DSE(Digital Special Effects) SELECT

- ✤ The DSE function works in CAM mode only.
- ✤ The digital effects enable you to give a creative look to your recording by adding various special effects.
- ✤ Select the appropriate digital effect for the type of picture that you wish to record and the effect you wish to create.
- ✤ There are 8 DSE modes.

a. ART mode
This mode gives the images a coarse effect.

b. MOSAIC mode
This mode gives the images a mosaic effect.

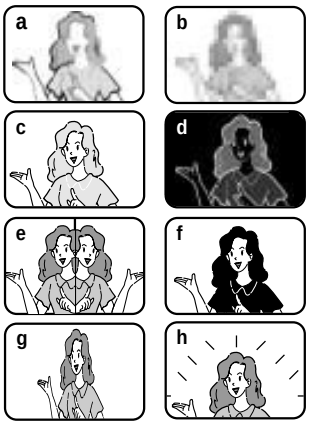
c. SEPIA mode
This mode gives the images a reddish-brown pigment.

d. NEGA mode
This mode reverses the colours of the images, creating a negative image.

e. MIRROR mode
This mode cuts the picture in half, using a mirror effect.

f. BLK & WHT mode
This mode changes the images to black and white.

g. WIDE [16:9] mode
Produce images in the WIDE [16:9] format for Playback on wide screen TVs.



h. STROBE mode
This effect converts on-screen action to a series of still images, giving an effect similar to slow-motion.

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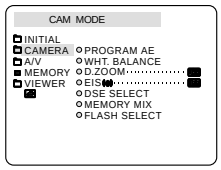
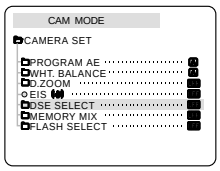
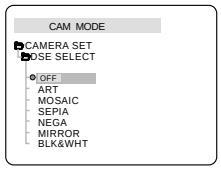
Advanced Recording

Selecting an effect

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - The menu list will appear.
3. Move the MENU SELECTOR to highlight CAMERA and push the MENU SELECTOR.
4. Select DSE SELECT from the submenu.
5. Push the MENU SELECTOR to enter the sub-menu.
6. Using MENU SELECTOR, select the DSE mode.
   - Push the MENU SELECTOR to confirm the DSE mode.
7. To exit, press the MENU button.







Note

- The DSE function will not operate in EASY mode.

ENGLISH

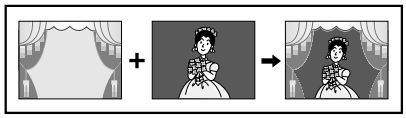
Advanced Recording

● MEMORY MIX

- ❖ The MEMORY MIX function works in CAM mode only.
- ❖ You can superimpose a still image you have recorded on the Memory Stick on top of the moving image you are recording.
- ❖ You can record the superimposed images on a tape.
- ❖ Select from 4 types of Memory Mix effects:

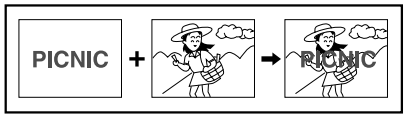
■ M. CHROMA (Memory chroma key)

- You can swap a blue area of a still image such as a picture frame with a moving image.



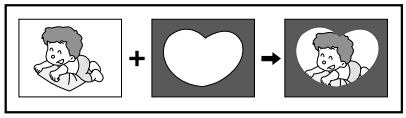
■ M.LUMI (Memory luminance key)

- You can swap a brighter area of a still image such as a handwritten illustration or title with a moving image.
  Make your own title or illustration by drawing or writing on a white piece of paper. Adjust the mix level in the light area of the still image.



■ C. LUMI (Camera luminance key)

- Superimpose the currently recording image on top of a still image, which becomes its background.
  Shoot the subject against a brighter background. The brighter area of the moving image will be a swapped with a still image.



■ M.OVER LAP (Memory overlap)

- You can make a moving image fade in on top of a still image recorded on the Memory Stick as the overlap function.

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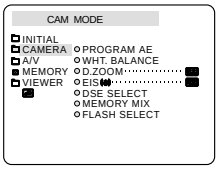
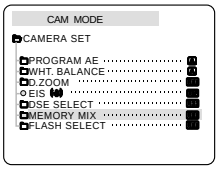
Advanced Recording

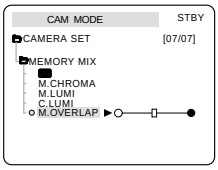
Recording Superimposed images on a tape

- ✤ Insert a tape for recording into your camcorder.
- ✤ Insert a Memory Stick is recorded still images into your camcorder.

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - ■ The menu list will appear.
3. Move the MENU SELECTOR to highlight CAMERA and push the MENU SELECTOR.
4. Select MEMORY MIX from the submenu and push the MENU SELECTOR.
5. Move the MENU SELECTOR to select the desired MEMORY MIX mode and push the MENU SELECTOR.
   - ■ Your currently recording image is combined with the last recorded image.
6. Press the ▶▶ (FWD)/ ◀◀(REV) buttons to select the still image you want to superimpose.
7. Move the MENU SELECTOR to adjust the mix level.
   - ■ Push the MENU SELECTOR to confirm the MEMORY MIX mode.
8. To exit, press the MENU button.
   - ■ Your selected MEMORY MIX mode is flashed in the display.
9. Press the MEMORY MIX button.
   - ■ The still image is superimposed on the moving image.
   - ■ Each time you press the MEMORY MIX button, your selection is activated (display lights continuously) or de activated (display flashes).
10. Press the START/STOP button to start recording.
    - ■ The superimposed images are recorded onto the tape.







Note

■ If you turn the position of the power switch, select your still image for MEMORY MIX again.

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Advanced Recording

Using the Built - in Flash

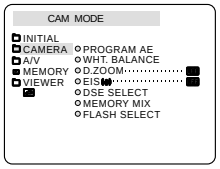
✤ You can take natural looking flash pictures with appropriate illumination using the built-in flash or attaching the VL-S1FL video Light/ Flash (optional) to the camcorder's Smart shoe (see page 100), whether they are night scenes, in doors or in other dark places.
- ■ OFF : The flash does not fire.
- ■ ϟA (Auto) : The flash comes on depending on the brightness of the subject.
- ■ ϟ (Flash on) : The flash comes on regardless of the brightness of the subject.
- ■ ϟ (Red-eye reduction auto: built-in flash only) : The flash pre-fires automatically before the main firing to reduce the red-eye phenomenon.

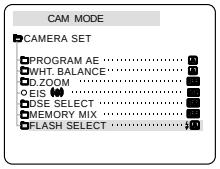
● FLASH SELECT

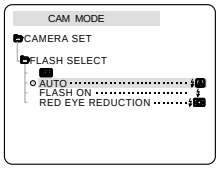
✤ The FLASH SELECT function works in CAM and M.REC mode.

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - ■ The menu list will appear
3. Move the MENU SELECTOR to highlight CAMERA and push the MENU SELECTOR.
4. Select FLASH SELECT from the submenu and push the MENU SELECTOR.
5. Using the MENU SELECTOR, Select the FLASH SELECT mode.
   - ■ Push the MENU SELECTOR to confirm the FLASH SELECT mode.
6. To exit, press the MENU button.

Warning! ■ **Do not fire the flash with the flash bulb covered with your hand.**
■ **Do not fire the flash close to people's eyes.**







Notes

- ■ While using the following functions, you cannot use the FLASH function:
  - PROGRAM AE, SHUTTER SPEED, EXPOSURE, STROBE (DSE function), SLOW SHUTTER, CONTINUOUS SHOT, MEMORY MIX
  - When you are recording movies onto a tape.
- ■ If the flash is forced to fire (Flash on) in a bright location, the effect of flash photography sometimes may not be obtained.
- ■ When ϟ (Red-eye reduction auto) is set, the flash fires to perform flash exposure compensation between the pre-firing for red-eye reduction and the main firing for taking photos. It takes about 1.5 second between the pre-firing for red-eye reduction and the main firing.

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Advanced Recording

● REC MODE

- ✤ The REC MODE function works in both CAM and PLAYER (VP-D93i/D97i/D99i only) modes.
- ✤ This camcorder records and plays back in SP (standard play) mode and in LP (long play) mode.
  - ■ SP (standard play): This mode permits 60 minutes of recording time with a DVM60 tape.
  - ■ LP (long play): This mode permits 90 minutes of recording time with a DVM60 tape.
  - ■ See AV IN/OUT select on page 75.

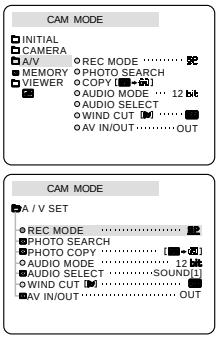
1. Set the camcorder to CAM or PLAYER mode.

2. Press the MENU button.
   - ■ The menu list will appear.

3. Move the MENU SELECTOR to highlight A/V and push the MENU SELECTOR.

4. Select REC MODE from the submenu and push the MENU SELECTOR.
   - ■ The REC MODE toggles between SP and LP with each press.

5. To exit, press the MENU button.



Notes

- ■ We recommend that you use this camcorder to play back any tapes recorded on this camcorder. Playing back a tape recorded in other equipment may produce mosaic shaped distortion.
- ■ When you record a tape in SP and LP modes, or LP mode only, the playback picture may be distorted or the time code may not be written properly between scenes.
- ■ Record using SP mode for best picture and sound quality.

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Advanced Recording

● AUDIO MODE

- ✤ The AUDIO MODE function works in CAM and PLAYER (VP-D93i/D97i/D99i only) modes.
- ✤ This camcorder records sound in two ways. (12bit, 16bit)
  - ■ 12bit : You can record two 12bit stereo sound tracks.
    The original stereo sound can be recorded onto the MAIN (SOUND1) track.
    Additional stereo sound can be dubbed onto the SUB (SOUND2) track.
  - ■ 16bit : You can record one high quality stereo sound using the 16bit recording mode.
    Audio dubbing is not possible when using this mode.

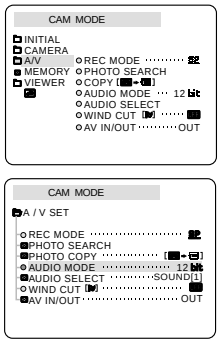
1. Set the camcorder to CAM mode.

2. Press the MENU button.
   - ■ The menu list will appear.

3. Move the MENU SELECTOR to highlight A/V and push the MENU SELECTOR.

4. Select the AUDIO MODE from the menu and push the MENU SELECTOR.
   - ■ The AUDIO MODE toggles between 12bit-16bit with each push.

5. To exit, press the MENU button.



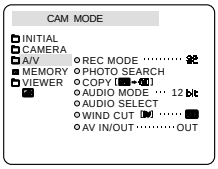
ENGLISH

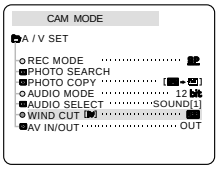
Advanced Recording

● WIND CUT

- ✤ The WIND CUT function works in CAM and PLAYER (VP-D93i/D97i/D99i only) modes.
- ✤ The WIND CUT function minimizes wind noise or other noise while recording.
  - When the wind cut is on, some low sounds are eliminated along with the sound of the wind.

1. Set the camcorder to CAM mode.
2. Press the MENU button.
   - ■ The menu list will appear.
3. Move the MENU SELECTOR to highlight A/V and push the MENU SELECTOR.
4. Select WIND CUT from submenu.
5. This feature toggles ON/OFF each time you push the MENU SELECTOR.
   - ■ [N] is shown in the display when you turn the WIND CUT on.
6. To exit, press the MENU button.





Notes

- ■ Make sure WIND CUT is set to off when you want the microphone to be as sensitive as possible.
- ■ Use the WIND CUT when recording in windy places such as the beach or near buildings.

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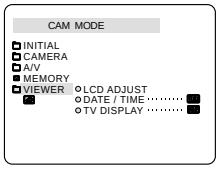
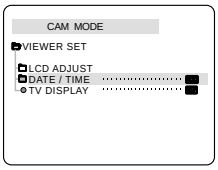
Advanced Recording

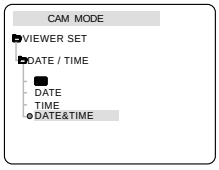
● DATE/TIME

- ✤ The DATE/TIME function works in CAM, PLAYER, M.REC and M.PLAY modes.
- ✤ The date and time are automatically recorded on a special data area of the tape.

1. Press the MENU button.
   - ■ The menu list will appear.
2. Move the MENU SELECTOR to highlight VIEWER and push the MENU SELECTOR.
3. Move the MENU SELECTOR to highlight DATE/TIME.
4. Push the MENU SELECTOR to select the sub-menu.
5. Using the MENU SELECTOR, select the DATE/TIME mode.
   - ■ You can choose to display - the OFF, DATE, TIME, DATE/TIME
     - OFF
     - DATE only
     - TIME only
     - DATE & TIME
   - ■ To return to the previous menu, highlight the DATE/TIME in the middle of the and push the MENU SELECTOR.
6. To exit, press the MENU button.







Notes

- ■ The DATE/TIME is not affected by the OSD ON/OFF (DISPLAY) button.
- ■ The DATE/TIME will read "- - -" in the following conditions.
  - During playback of a blank section of a tape.
  - If the tape was recorded before setting the DATE/TIME in the Camera's memory.
  - When the lithium battery becomes weak or dead.
- ■ Before you can use the DATE/TIME function, you must set the Clock.
  See CLOCK SET on page 37.

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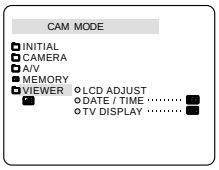
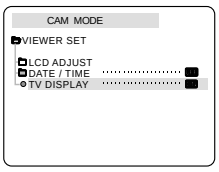
Advanced Recording

● TV DISPLAY

- ✤ The TV DISPLAY function works in CAM, PLAYER, M.REC and M.PLAY modes.
- ✤ You can select the output path of the OSD (On Screen Display).
  - ■ OFF: The OSD appears in the LCD screen only.
  - ■ ON: The OSD appears in the LCD screen, View Finder and TV.
  - ■ Use the DISPLAY button located at the left side of the camcorder to turn ON/OFF all of the OSD displayed on the LCD/View Finder/TV.

1. Set the camcorder to CAM, PLAYER, M.REC and M.PLAY mode.
2. Press the MENU button.
   - ■ The menu list will appear.
3. Move the MENU SELECTOR to highlight VIEWER and push the MENU SELECTOR.
4. Select the TV DISPLAY mode in list, push the MENU SELECTOR.
   - ■ The DISPLAY mode switches between ON/OFF with each push.
5. To exit, press the MENU button.





ENGLISH

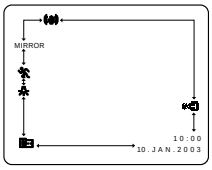
Advanced Recording

Using Quick Menu(Navigation Menu)

- ✤ Quick menu is available only in CAM and M.REC mode.
- ✤ Quick menu is used to adjust camera functions by simply using the MENU SELECTOR button. This feature is useful for when you want to make simple adjustments without having to access the menus and submenus.

■ **DATE/TIME (see page 56)**
- Each time you select DATE/TIME and push the MENU SELECTOR, it will be displayed in the order of DATE - TIME - DATE/TIME - OFF.

■ **WL.REMOTE( ) (see page 38)**
- Each time you select WL.REMOTE and push the MENU SELECTOR, the WL.REMOTE is switched to either enabled ( ) or disabled ( ).



(CAM mode)

■ **EIS ( ) (see page 47)**
- Each time you select EIS and push the MENU SELECTOR, the EIS icon is displayed or set to OFF.

■ **DSE (Digital Special Effect) (see page 48)**
- Each time you select DSE and push the MENU SELECTOR, the DSE preset values are applied or set to OFF. DSE values will not switch between On and Off if they have not been preset in the menu.

■ **PROGRAM AE (see page 42)**
- Each time you select PROGRAM AE and push the MENU SELECTOR, you can choose between the preset PROGRAM AE values and AUTO. You can't choose between Auto and the PROGRAM AE values if the values have not been preset in the regular menu.

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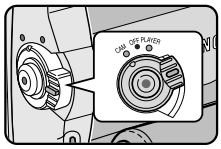
Advanced Recording

■ **WHT. BALANCE (see page 44)**
- Each time you select WHT. BALANCE and push the MENU SELECTOR, you can choose between preset WHT.BALANCE values and AUTO. As in PROGRAM AE, you can't choose between Auto and WHT.BALANCE values it they have not been preset.

■ **SHUTTER SPEED & EXPOSURE**
- You can set values for SHUTTER SPEED and EXPOSURE by selecting ( ) icon and pushing the MENU SELECTOR. For more information, see the next chapter.

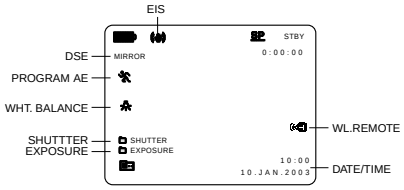
Setting the Quick menu

1. Set the camcorder to CAM mode.
2. Move the MENU SELECTOR to select a function you want and then push the MENU SELECTOR to change the values.



Note

■ Quick menu function will not operate in EASY mode.



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Advanced Recording

SHUTTER SPEED & EXPOSURE

- ✤ You can set SHUTTER SPEED and EXPOSURE in CAM/M.REC mode.
- ✤ SHUTTER SPEED and EXPOSURE values can only be set in the Quick Menu.
- ✤ SHUTTER SPEED and EXPOSURE are automatically switched and/or deactivated.

1. Set the power switch to CAM mode.
2. Move the MENU SELECTOR until you see icon( ) on, and then push the MENU SELECTOR.
   - ■ You see a screen on which you can select SHUTTER SPEED and EXPOSURE.
   - ■ Move the MENU SELECTOR to select the item you want and then push the MENU SELECTOR.
   - ■ SHUTTER SPEED can be set to 1/50, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000 or 1/10000.
   - ■ Only SHUTTER SPEED up to 1/250 are available when using a M.REC mode.
   - ■ EXPOSURE can be set between 00 and 29.
3. To exit from the setting screen, select the icon( ) and push the MENU SELECTOR.

Recommended Shutter speeds when recording

- ✤ Outdoor sports such as golf or tennis : 1/2000 or 1/4000.
- ✤ Moving cars or trains or other rapidly moving vehicles such as roller coasters : 1/1000, 1/500 or 1/250
- ✤ Indoor sports such as basketball : 1/120

Notes

- ■ If you want to use the selected shutter speed and exposure value, you should begin the recording with the shutter speed and the exposure adjustment screens displayed on the LCD.
- ■ If you manually change the shutter speed and the exposure value when Auto-exposure option is selected, manual changes are applied first.
- ■ The image may not seem as smooth when a high shutter speed is set.
- ■ The camcorder returns to the auto shutter setting and auto exposure setting when you change to the EASY, SLOW SHUTTER modes.
- ■ When recording with a SHUTTER SPEED of 1/1000 or higher, make sure the sun is not shining into the lens.
- ■ When recording with a SHUTTER SPEED or EXPOSURE, the Flash function doesnot work.

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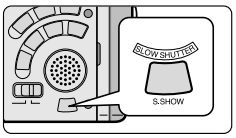
Advanced Recording

SLOW SHUTTER (Low Shutter Speed)

✤ The SLOW SHUTTER function works in CAM mode only.
✤ The shutter speed can be controlled, allowing you to record slow moving objects.

1. Set the power switch to CAM mode.
2. Press the SLOW SHUTTER button.
3. Each time you press the SLOW SHUTTER button, SHUTTER SPEED is changed to 1/25, 1/12, 1/6, off.
4. To exit, press the SLOW SHUTTER button.



Notes

- When using "SLOW SHUTTER" the image takes on a slow motion like effect.
- The SLOW SHUTTER function will not operate in EASY mode.
- While using the SLOW SHUTTER function, you cannot use the following functions:
  - PROGRAM AE, EIS, Digital Zoom, SHUTTER SPEED, EXPOSURE, DSE, MEMORY MIX, Flash
- When using “SLOW SHUTTER” function, the focus is adjusted slowly and sometimes the white defects will appear on the screen, but it is not malfunction.

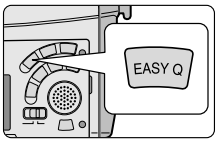
ENGLISH

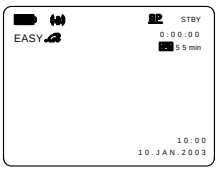
Advanced Recording

EASY Mode (for Beginners)

✤ The EASY mode allows a beginner to easily make good recordings.
  - The EASY mode only operates in CAM mode.

1. Set the power switch to CAM mode.
2. By pressing the EASY button, all functions on the camera will be set to off and the recording settings will be set to the following basic modes:
   - Battery level, recording mode, counter, DATE/TIME, and EIS ( ) will be displayed.
   - The word “EASY.Q” will appear on the LCD at the same time. However, the DATE/TIME will only be seen if it has been previously set. (see page 56)
3. Press START/STOP to start recording.
   - Recording will begin using the basic automatic settings.
4. Pressing the EASY button again turns the EASY mode off.
   - The camera will return to the settings that were set prior to activating EASY mode.





Notes

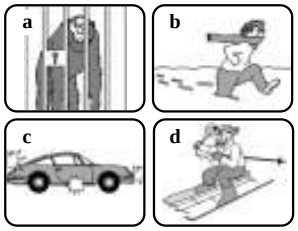
- In EASY mode, certain functions are not available, such as MENU, BLC, MF/AF.
  - If you want to use these functions, you must first switch the EASY mode off.
- The EASY mode settings are deleted when the battery pack is uninstalled from the camcorder and therefore, they must be reset when a battery pack has been replaced.

ENGLISH

Advanced Recording

MF/AF (Manual Focus/Auto Focus)

- ✤ The MF/AF function works in CAM, M.REC mode only.
- ✤ In most situations, it is better to use the automatic focus feature, as it enables you to concentrate on the creative side of your recording.
- ✤ Manual focusing may be necessary under certain conditions that make automatic focusing difficult and/or unreliable.



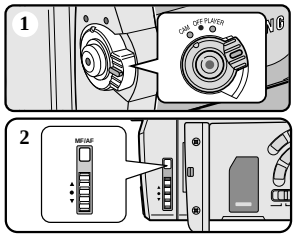
Auto Focusing

- ✤ If you are inexperienced in the use of camcorders, we recommend that you make use of Auto Focus.

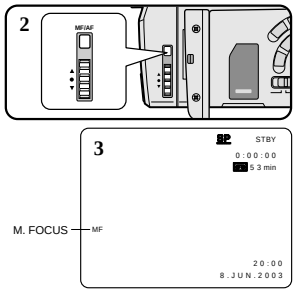
Manual Focusing

- ✤ In the following cases you may obtain better results by adjusting the focus manually.

a. A picture containing several objects, some close to the camcorder, others further away.
b. A person enveloped in fog or surrounded by snow.
c. Very shiny or glossy surfaces like a car.
d. People or objects moving constantly or quickly like an athlete or a crowd.



1. Set the power switch to CAM mode.
2. Frame the picture with the zoom control.
   - ■ If you use the zoom after manual focusing, the picture may go out of focus.
3. Press the MF/AF button to switch to manual focus.
   - ■ M. FOCUS(MF) appears in the display.
4. Turn the MF dial up or down until the object is in focus.
   - ■ Zoom out a little if focusing is difficult.
5. To return to AF(Auto Focus: [A]), press the MF/AF button again.

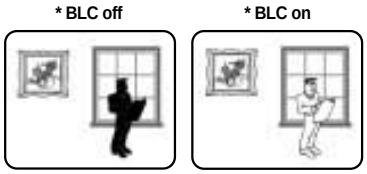


ENGLISH

Advanced Recording

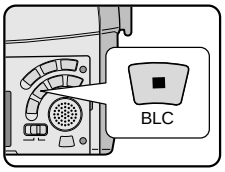
BLC (Back Light Compensation)

- ✤ BLC works in CAM/M.REC mode.
- ✤ Back lighting exists when the subject is darker than the background:
  - ■ The subject is in front of a window.
  - ■ The person to be recorded is wearing white or shiny clothes and is placed against a bright background; the person's face is too dark to distinguish his/her features.
  - ■ The subject is outdoors and the background is overcast.
  - ■ The light sources are too bright.
  - ■ The subject is against a snowy background.



1. Set the power switch to CAM mode.

2. Press the BLC button.
   - ■ Normal - BLC - Normal
   - ■ BLC enhances the subject.



Note

- ■ The BLC function will not operate in EASY mode.

ENGLISH

Advanced Recording

Fade In and Out

- ✤ The FADE function works in CAM mode only.
- ✤ You can give your recordings a professional look by using special effects such as fading in at the beginning of a sequence or fading out at the end of a sequence.

To Start Recording

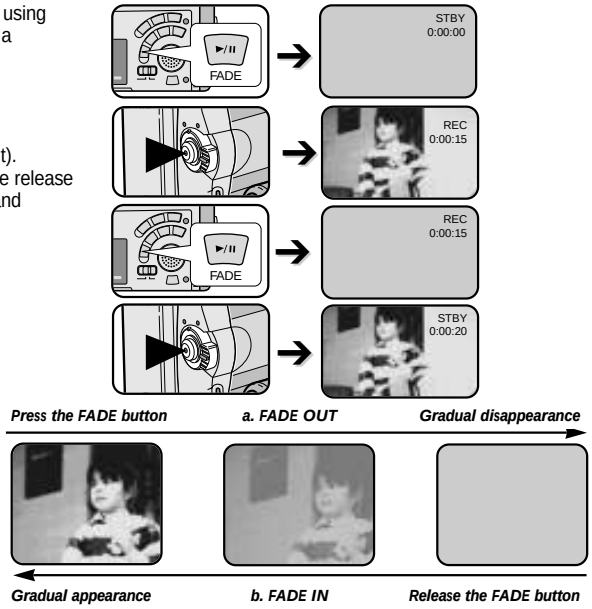
1. Before recording, hold down the FADE button. The picture and sound gradually disappear (fade out).
2. Press the START/STOP button and at the same time release the FADE button. Recording starts and the picture and sound gradually appear (fade in).

To Stop Recording (use FADE IN / FADE OUT)

3. When you wish to stop recording, hold down the FADE button. The picture and sound gradually disappear (fade out).
4. When the picture has disappeared, press the START/STOP button to stop recording.

a. FADE OUT (Approx. 4 seconds)

b. FADE IN (Approx. 4 seconds)



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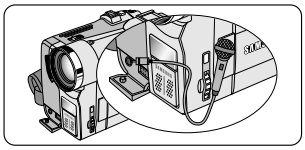
Advanced Recording

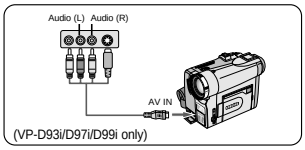
Audio dubbing

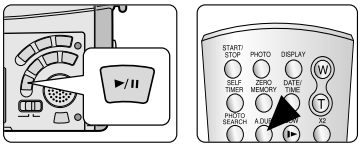
- ✤ The AUDIO DUBBING function only works in PLAYER Mode.
- ✤ You can add sound to the original sound on a pre-recorded tape, recorded in SP mode with 12bit sound.
- ✤ Use the internal and external microphones or other audio equipment.
- ✤ The original sound will not be erased.

Dubbing sound

1. Set the camcorder to PLAYER mode.
   - ■ If you want to use an external microphone, connect the microphone to the external MIC input jack on the camcorder.
   - ■ When you wish to dub using the External A/V input, connect the Multi-AV cable to the camcorder by inserting the Multi-AV cable into the Multi-AV Jack at the front side of the camcorder. (VP-D93i/D97i/D99i only)
     - Press the MENU button, move the MENU SELECTOR to highlight A/V and push the MENU SELECTOR.
     - Move the MENU SELECTOR to highlight AV IN/OUT and push the MENU SELECTOR to select AV IN/OUT.
     - Move the MENU SELECTOR to highlight AV IN(or S-VIDEO IN) and push the MENU SELECTOR to select AV IN(or S-VIDEO IN).
2. Press the ▶/II (PLAY/STILL) button and find the timeframe of the scene to be dubbed.
3. Press the ▶/II (PLAY/STILL) button to pause the scene.
4. Press the A.DUB button on the Remote Control.
   - ■ A.DUB will be displayed on the LCD.
   - ■ The camcorder is in a ready-to-dub state for dubbing.
5. Press the ▶/II (PLAY/STILL) button to start dubbing.
   - ■ Press the ■ (STOP) button to stop the dubbing.







Notes

- ■ You can not use the audio dubbing function while playing a write protected video tape.
- ■ When you wish to dub using the External A/V input, you must connect the Multi-AV cable to the audio system from which you wish to record. (VP-D93i/D97i/D99i only)
- ■ When adding sound using the built-in microphone, make sure not to connect any cables to the camcorder.
- ■ You can not dub sound on a pre-recorded tape in LP mode or 16 bit mode.

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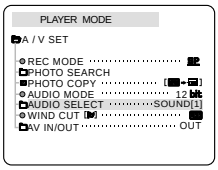
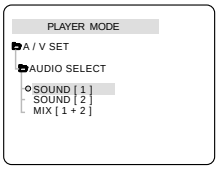
Advanced Recording

Dubbed audio Playback

1. Insert the dubbed tape and press MENU button.
2. Move the MENU SELECTOR to highlight A/V.
3. Push the MENU SELECTOR to enter the sub-menu.
4. Use the MENU SELECTOR to select AUDIO SELECT from the submenu.
5. Push the MENU SELECTOR to enter the sub-menu.
6. Using the MENU SELECTOR, select the AUDIO playback channel.
   - Push the MENU SELECTOR to confirm the audio playback channel.
     - SOUND1 : play the original sound.
     - SOUND2 : play the dubbed sound.
     - MIX(1+2) : play back SOUND1 and 2 equally mixed.
7. To exit, press the MENU button.
8. Press the ▶/II (PLAY/STILL) button to playback the dubbed tape.





Note

- When you playback added sound (SOUND2 or MIX mode), you may experience loss of sound quality.

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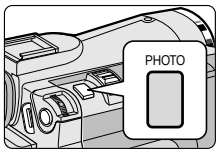
Advanced Recording

PHOTO Image Recording

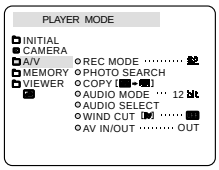
1. Press the PHOTO button lightly (about halfway down) and hold it.
   - The still picture appears on the LCD monitor.
   - If you do not wish to record, release the button.
2. Press the PHOTO button fully down.
   - The still picture is recorded for about 6~7 seconds.
3. After the PHOTO has been recorded, the camcorder returns to STBY mode.

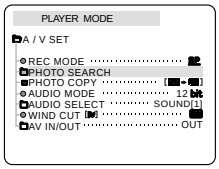


Searching for a PHOTO picture

❖ The PHOTO SEARCH works in PLAYER mode only.

1. Press the MENU button. (or press the PHOTO SEARCH button on the remote control.)
   - The MENU list will appear.
2. Move the MENU SELECTOR to highlight A/V.
3. Push the MENU SELECTOR to enter the sub-menu.
4. Select PHOTO SEARCH from the sub-menu and push the MENU SELECTOR.
5. Search the PHOTO using the ▶▶ (FF) and ◀◀ (REW) buttons.
   - The PHOTO search process appears on the LCD while you are searching.
   - After completing the search, the camcorder displays the still image.
6. To exit, press the ■ (STOP) button.





ENGLISH

Advanced Recording

Various Recording Techniques

❖ In some situations different recording techniques may be required for more dramatic results.

Note

Please rotate the LCD screen carefully as excessive rotation may cause damage to the inside of the hinge that connects the LCD screen to the Camcorder.

1. General recording.

2. Downward recording.

Making a recording with a top view of the LCD screen.

3. Upward recording.

Making a recording viewing the LCD screen from below.

4. Self recording.

Making a recording viewing the LCD screen from the front.

5. Recording with the Viewfinder.

■ In circumstances where it is difficult to use the LCD monitor, the viewfinder can be used as a convenient alternative.

ENGLISH

Playback

Tape Playback

❖ The playback function works in PLAYER mode only.

Playback on the LCD

❖ It is practical to view a tape using the LCD when in a car or outdoors.

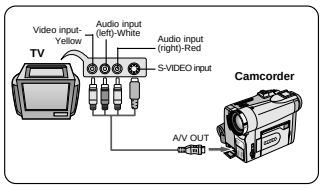
Playback on a TV monitor

❖ To play back a tape, the television must have a compatible colour system.
❖ We recommend that you use the AC Power Adapter as the power source for the camcorder.

Connecting to a TV which has Audio/Video input jacks

1. Connect the camcorder and TV with the Multi-AV cable.
   ■ The yellow plug : Video
   ■ The white plug : Audio(L)
   ■ The red plug : Audio(R) - STEREO only
   - If you connect to a monaural TV or VCR, connect the yellow plug (Video) to the video input of the TV or VCR and the white plug (Audio L) to the audio input of the TV or VCR.

   ❖ You may use the SCART adapter (optional).
2. Set the power switch on the camcorder to PLAYER mode.
3. Turn on the TV and set the TV/VIDEO selector on the TV to VIDEO.
   ■ Refer to the TV or VCR user's manual.
4. Play the tape back.



Notes

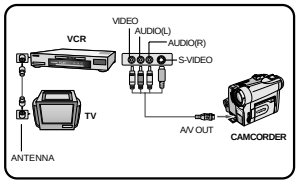
■ You may use the S-VIDEO plug to obtain better quality pictures if you have a S-VIDEO connector on your TV.
■ Even if you use a S-VIDEO plug, you need to connect an audio cable.
■ If you connect the cable to the Multi-AV Jack, you will not hear sound from the speakers.

ENGLISH

Playback

Connecting to a TV which has no Audio and Video input jacks

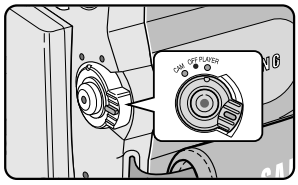
✤ You can connect your camcorder to a TV through a VCR.



1. Connect the camcorder and VCR with the Multi-AV cable.
   - The yellow plug : Video
   - The white plug : Audio(L) - Mono
   - The red plug : Audio(R)
2. Connect a TV to the VCR.
3. Set the power switch on the camcorder to PLAYER mode.
4. Turn on both the TV and VCR.
   - Set the input selector on the VCR to LINE.
   - Select the channel reserved for your VCR on the TV set.
5. Play the tape back.

Playback

✤ You can play the recorded tape in PLAYER mode.



1. Connect a power source and set the power switch to PLAYER mode.
2. Insert the tape you wish to play back.
3. Using the ▶▶ (FF) and ◀◀ (REW) buttons, find the first position you wish to play back.
4. Press the ▶/II (PLAY/STILL) button.
   - The images you recorded will appear on the TV after a few seconds.
   - If a tape reaches its end while being played back, the tape will rewind automatically.

Note

- The playback mode (SP/LP) is selected automatically.

ENGLISH

Playback

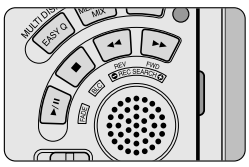
Various Functions while in PLAYER mode

✤ The PLAY/STILL, STOP, FF, REW buttons are located on the camcorder and the Remote Control.
✤ The F.ADV(Frame advance), X2, SLOW buttons are located on the Remote Control only.
✤ To prevent tape and head-drum wear, your camcorder will automatically stop if it is left in STILL or SLOW modes for more than 3 minutes.

Playback pause

✤ Press the ▶/II (PLAY/STILL) button during Playback.

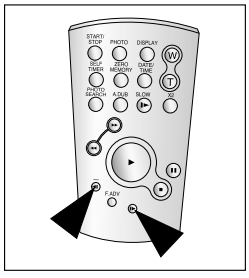
✤ To resume playback, press the ▶/II (PLAY/STILL) button.



Picture search (Forward/Reverse)

✤ Press the ▶▶ (FF) or ◀◀ (REW) buttons once during Playback or Still mode.
To resume normal playback, press the ▶/II (PLAY/STILL) button.

✤ Keep pressing ▶▶ (FF) or ◀◀ (REW) buttons during Playback or Still mode.
To resume normal playback, release the button.



Slow playback (Forward/Reverse)

✤ Forward Slow Playback
   - Press the SLOW button on the remote control during Playback.
   - To resume normal playback, press the ▶/II (PLAY/STILL) button.

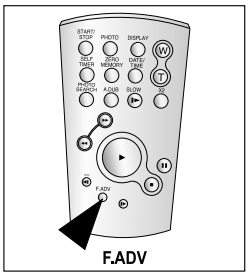
✤ Reverse Slow Playback
   - Press the ◀II (–) button during Forward Slow Play back.
   - To resume forward slow playback, press the II▶ (+) button.
   - To resume normal playback, press the ▶/II (PLAY/STILL) button.

ENGLISH

Playback

Frame advance (To play back frame by frame)

- Press the F.ADV button on the Remote Control while in Still mode. The F.ADV function works in still mode only.
- To resume normal playback, press the ▶/II (PLAY/STILL) button.
  - ✤ Forward frame advance
    - ■ Press the F.ADV button on the remote control in Still mode.
  - ✤ Reverse frame advance
    - ■ Press ◀II (–) the button on the remote control to change the direction in F.ADV mode.
    - ■ Press the F.ADV button on the remote control.



X2 Playback (Forward/Reverse)

- ✤ Forward X2 Playback
  - ■ Press the X2 button on the Remote Control during Playback.
  - ■ To resume normal playback, press the ▶/II (PLAY/STILL) button.
- ✤ Reverse X2 Playback
  - ■ Press ◀II (–) the button during during Forward X2 Playback
  - ■ To resume normal playback, press the ▶/II (PLAY/STILL) button.

Reverse playback

- ✤ To playback in reverse at normal speed, press the ◀II (–) button during normal forward playback.
- ✤ Press the ▶/II (PLAY/STILL) or II▶ (+) button to return to normal forward playback.

Notes

- ■ Mosaic shaped distortion may appear on the screen while in some of the various playback modes.
  - Mosaic shaped distortion or noise may be experienced when you play back tapes recorded in LP which contain various playback functions.
- ■ Sound will only be heard during normal SP or LP playback.

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Playback

ZERO MEMORY

- ✤ The MEMORY function works in both CAM and PLAYER modes.
- ✤ You can mark a point on a tape that you want to return to following playback.

1. Press the ZERO MEMORY button on the remote control during playback or recording at the point you wish to return to.
   - ■ The time code is changed to a tape counter that is set to zero memory with the M 0:00:00(Zero memory indicator)
   - ■ If you want to cancel the zero memory function, press the ZERO MEMORY button again.

2. Finding the zero position.
   - ■ When you have finished playback, fast forward or rewind the tape.
     - The tape stops automatically when it reaches the zero position.
   - ■ When you have finished recording, press the power switch on the PLAYER and press the ◀◀ (REW) button.
     - The tape stops automatically when it reaches the zero position.

3. The tape counter with the M (Zero memory indicator) disappears from the display and the tape counter is changed to the time code.

Notes

- ■ In the following situations, ZERO MEMORY mode may be canceled automatically:
  - At the end of the section marked with the ZERO MEMORY function.
  - When the tape is ejected.
  - When you remove the battery pack or power supply.
- ■ The zero memory may not function correctly where there is a break between recordings on the tape.

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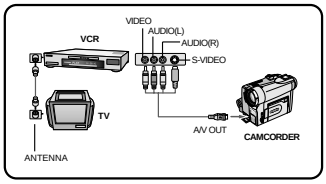
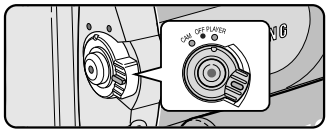
Recording in PLAYER mode

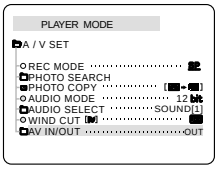
Recording in PLAYER mode (VP-D93i/D97i/D99i only)

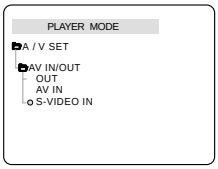
✤ You can use this camcorder as a recorder.
✤ You can record a tape from VCR or TV.





1. Connect the camcorder and VCR or TV with the Multi-AV cable.
2. Set the power switch of the camcorder to PLAYER mode.
3. Turn on the VCR or TV.
4. Insert the blank tape with protection tab closed into the camcorder.
   - ■ If you want to record from a connected VCR, insert a recorded VHS tape into the VCR.
5. Push the MENU button, move the MENU SELECTOR to highlight A/V and push the MENU SELECTOR.
6. Move the MENU SELECTOR to highlight AV IN/OUT and push the MENU SELECTOR to select AV IN/OUT.
7. Move the MENU SELECTOR to highlight AV IN or S-VIDEO IN and push the MENU SELECTOR.
   - ■ "AV IN" and picture appear on the LCD monitor.
   - ■ OUT : Releases the INPUT mode
   - ■ AV IN : When signals are received from the Audio/Video input jacks
   - ■ S-VIDEO IN : When signals are received from the the S-video (S-Jack plug) and Audio inputs
8. Press the START/STOP button to set the camcorder to REC PAUSE mode.
   - ■ "PAUSE" on the LCD monitor.
9. Select the TV program or playback the VHS tape.
10. Press START/STOP button to start recording.
    - ■ If you want to pause recording for a while, press the START/STOP button again.
11. To stop recording, press the ■ (STOP) button.





Notes

- ■ When you record the images being played back on analog VCR, if they are not being played back in normal speed, (for example, more than double speed or slow playback), only gray image appears on the camcorder.
- ■ If you want to see the camcorder picture with a TV, set AV IN/OUT menu to OUT.

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IEEE 1394 Data Transfer

Transferring IEEE1394 (i.LINK)-DV standard data connections

Connecting to a DV device

✤ Connecting with other DV standard products.
- ■ A standard DV connection is quite simple. If a product has a DV port, you can transfer data by connecting to the DV port using the correct cable.

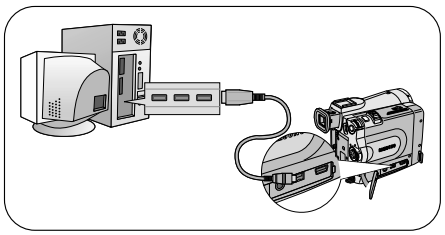
!!! Please be careful since there are two types of DV ports, (4pin, 6pin). This camcorder has a 4pin terminal.

✤ With a digital connection, video and audio signals are transmitted in digital format, allowing high quality images to be transferred.

Connecting to a PC

✤ If you want to transmit data to a PC, you must install a IEEE 1394 add-on card onto the PC. (not supplied)
- ■ Turn off the power of both the camcorder and the PC before connecting.
- ■ Optional software necessary.

✤ The frame rate recorded for video capturing is dependent on the capacity of the PC.



● System requirements

- ■ CPU : faster Intel® Pentium III™ 450Mhz compatible.
- ■ Operating system : Windows® 98SE, ME, 2000, XP, Mac OS (9.1~10.2)
- ■ Main memory : more than 64 MB RAM
- ■ IEEE1394 add-on card or built in IEEE1394 card

Notes

- ■ When you transmit data from the camcorder to another DV device, some functions may not work. If this occurs, please reconnect the DV cable or turn the power OFF and ON again.
- ■ Operation may not work correctly, depending on the software you are using, and the specifications of your PC and its settings.
  - See your PC instruction manual for details.
- ■ When you transmit data from the camcorder to PC, PC function button is available in PLAYER mode only.
- ■ Do not use the camcorder and IEEE1394 together as this will cause IEEE1394 to shut off.
- ■ Do not disconnect the DV cable while data is being transferred to the PC.

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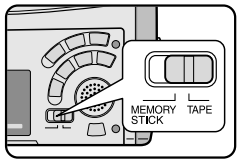
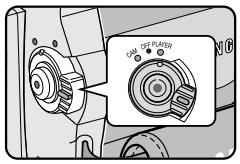
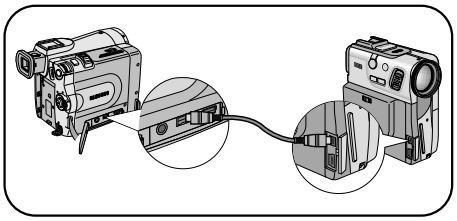
IEEE 1394 Data Transfer

Recording with a DV connection cable (VP-D93i/D97i/D99i only)

1. Set the mode switch to TAPE.
2. Set the power switch to PLAYER mode.
3. Connect the DV cable (not supplied) from the DV IN/OUT port of the camcorder to the DV IN/OUT port of the other DV device.
   - Make sure that DV appears on the screen.
4. Press the START/STOP button to begin REC PAUSE mode.
   - PAUSE is displayed on the OSD.
5. Start playback on the other DV device while you monitor the picture.
6. Press the START/STOP button to start recording.
   - If you want to pause recording momentarily, press the START/STOP button again.
7. To stop recording, press the ■ (STOP) button.







Notes

- When using this camcorder as a recorder, the pictures that appear on a monitor may seem uneven, however recorded pictures will not be affected.
- Operation are not guaranteed for all the recommanded computer environments mentioned above.

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USB interface

● Transferring a Digital Image through a USB Connection

- ❖ You can easily transfer still images/movies from a camera, tape to a PC without additional add-on cards via a USB connection.
- ❖ You can transfer an image to a PC via a USB connection.
- ❖ If you transfer data to a PC, you need to install the software (Driver, Editing software) supplied with the camcorder.

System Requirements

- CPU : Intel® Pentium II™ 400MHz processor compatible or better
- Operating system : Windows® 98SE/ME/2000/XP
- RAM : 64 MB or more
- CD-ROM: 4x CD-ROM drive
- VIDEO : 65,000-colour or better video display card
- Available USB port
- Hard Disc : 4GB (8GB recommended)

Notes

- Intel® Pentium II™ is a trademark of the Intel Corporation.
- Windows® is a registered trademark of the Microsoft® Corporation.
- All other brands and names are property of their respective owners.
- Operations are not guaranteed for all of the recommended computer environments mentioned above.

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USB interface

Installing DVC Media 6.0 Program

- ✤ Do not connect the camcorder to PC before installing the program.
- ✤ If another camera or scanner is connected, please disconnect it in advance.

Program installation

1. Insert the software CD into CD-ROM drive.
   - Installation selection screen appears in the monitor.
2. If the installation selection screen does not appear after inserting the CD click “Run” on the Windows “Start” menu and execute SETUP.EXE file to begin installation.
   - When CD-ROM drive is set to “D:drive”, type “D:\setup.exe” and press Enter.
3. Click one of the icons listed below to install the selected software. (The program automatically check and install the driver which the PC is needed)
   - ■ DVC Driver: USB PC CAMERA Driver (Capture driver, Twain driver)
   - ■ DVC Media 6.0: PC Application program
   - ■ Photo Edition: Editing Software
   - ■ MS Formatter: Using when you format Memory Stick on your PC

1.

Using the “PC camera” function

- ✤ You can use this camcorder as a PC CAMERA.
- ✤ When you connect to a Web site that can provide video chatting functions, you can use your camcorder for such functions.
- ✤ Using the camcorder with PC installed Net-meeting program, you can conduct video conference.
- ✤ The screen size of PC CAMERA is 160 × 120 Pixel. (320 × 240)

1. Set the mode switch to Tape or Memory Stick, set the power switch to CAM.
2. Connect one end of the USB cable to the USB jack on the camcorder and the other end to the USB connector on your computer.

Note

- ■ DVC Media 6.0 User’s Manual is included on the accompanying CD in Adobe’s Portable Document Format (PDF). The user’s manual can be viewed using Acrobat Reader software, which is also included on the CD. (The Acrobat Reader is a freeware product of adobe systems, Inc.)

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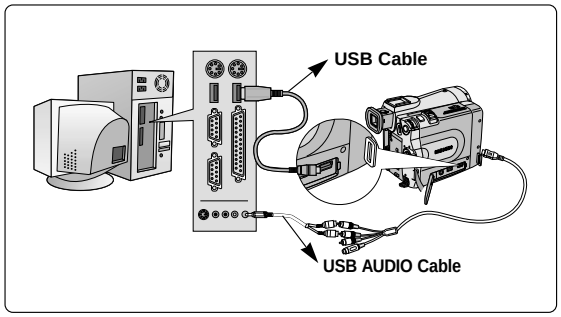
USB interface

Connecting to a PC

1. Connect a USB cable to the USB port on the PC.
2. Connect the other end of the USB cable into the proper terminal on the camcorder. (USB jack)
3. Connect the audio cable to the Line input jack of the PC. If the PC has no Line input jack, connect the audio cable to the MIC input jack. There is a possibility you’ll here some audio noise if you use the MIC jack.

Notes

- ■ If you disconnect the USB cable from the PC or the camcorder while transferring, the data transmission will stop and the data may be damaged.
- ■ If you connect the USB cable to a PC via a USB HUB or simultaneously connect the USB cable along with other USB devices, the camcorder may not work properly.
  - If this occurs, remove all USB devices from the PC and reconnect the camcorder.



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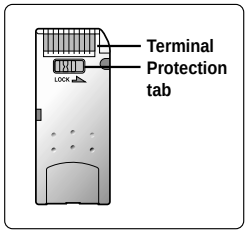
Digital Still Camera mode

MEMORY STICK

❖ The Memory Stick stores and manages still images or moving images recorded by the camera.

Memory Stick Functions

❖ Recording still images and MJPEG movie
❖ Viewing still images and MJPEG movie
  ■ Single
  ■ Slide show
  ■ Multi display
❖ Protecting images against accidental erasure
❖ Deleting images recorded on a Memory Stick
❖ Print marking still images
❖ Formatting a Memory Stick



Notes

■ You can use most of the camera's functions when recording to the Memory Stick.
■ "▶▶ " appears on the screen while recording to the Memory Stick.
■ While recording or loading an image, do not eject or insert the Memory Stick.
  - Inserting or ejecting a Memory Stick while recording or loading an image can cause data damage.
■ If you want to save all images on the Memory Stick, set the write protect tab on the Memory Stick to LOCK.

MEMORY STICK ™

● "Memory Stick" and MEMORY STICK ™ are trademarks of Sony Corporation.
● All other product names mentioned herein may be the trademarks or registered trademarks of their respective companies. Furthermore, "™"and "®" are not mentioned in each case in this manual.
● "Memory Stick PRO" can not be used with this unit.

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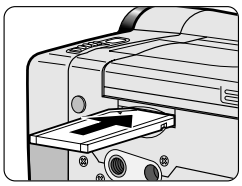
Digital Still Camera mode

Inserting and ejecting the Memory Stick

● **Inserting the Memory Stick**

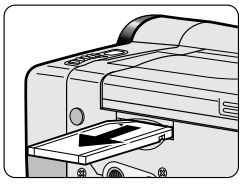
1. Turn the Power switch to OFF.
2. Insert the Memory Stick into the Memory Stick slot located beneath the camcorder, in the direction of the arrow.



● **Ejecting the Memory Stick**

1. Turn the Power switch to OFF.
2. Push the Memory Stick, then it comes out of the camcorder automatically.
3. Pull out the Memory Stick.

❖ Do not attempt to pull the Memory Stick out without first pushing it in.



Notes

■ If you set the camcorder to M.PLAY mode, the last recorded image appears.
  - If there are no recorded images on the Memory Stick, "NO STORED IMAGE!"and will display on the screen.
■ Do not turn the power off while recording, loading, erasing or formatting.
■ Please turn the power off before you insert or eject the Memory Stick. You could lose data on the Memory Stick.

■ Do not allow metal substances to come in contact with the terminals of the Memory Stick.
■ Do not bend, drop or apply strong shock to Memory Stick.
■ After pulling the Memory Stick out from the camcorder, please keep the Memory Stick in a soft case to prevent static shock.
■ The stored contents may be changed or lost as a result of misuse, static electricity, electric noise or repair. Save important images separately.
■ Samsung is not responsible for data loss due to misuse.
■ If the USB cable is connected to the camcorder, the ▶▶ (FWD), ◀◀ (REV), ■ , S.SHOW, MULTI-DISPLAY buttons are not available in M.PLAY mode.

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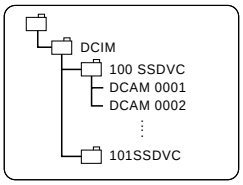
Digital Still Camera mode

Structure of folders and files on the Memory Stick

- ❖ The still images that you recorded are saved in JPEG file format on the Memory Stick.
- ❖ The moving images that you recorded are saved in MJPEG file format on the Memory Stick.
- ❖ Each file has a file number and all files are assigned to a folder.
  - ■ A file number from DCAM0001 to DCAM9999 is sequentially assigned to each recorded image.
  - ■ Each folder is numbered from 100SSDVC to 999SSDVC and recorded on the Memory Stick.



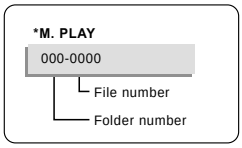
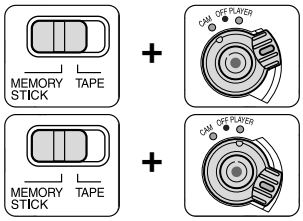


Image Format

- ❖ Still image
  - ■ Images are compressed in JPEG (Joint Photographic Experts Group) format.
  - ■ The number of pixels are 1280 × 960, 640 × 480 in each mode.
- ❖ Moving Image
  - ■ Images are compressed in MJPEG (Motion Joint Photographic Experts Group) format.
  - ■ The number of pixels are 320 × 240, 160 × 120 in each mode.

Selecting the CAMCORDER mode

- ❖ You can use this camcorder as a Digital Still Camera (DSC).
- ❖ You have to set the mode switch to MEMORY STICK position to use this camcorder as Digital Still Camera.
  - ■ M.REC mode (Memory RECORD mode)
    1. Set the mode switch to MEMORY STICK.
    2. Set the power switch to CAM.
  - ■ M.PLAY mode (Memory PLAYBACK mode)
    1. Set the mode switch to MEMORY STICK.
    2. Set the power switch to PLAYER.



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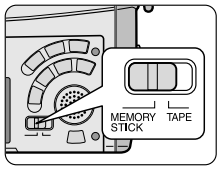
Digital Still Camera mode

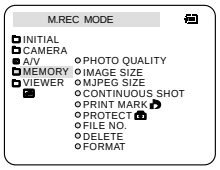
Selecting the image quality

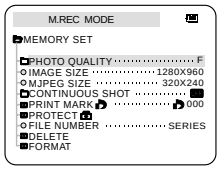
- ❖ You can select the quality of a still image to be recorded.

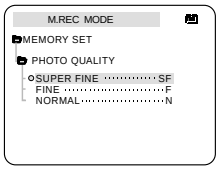
Select the photo quality

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to the CAM mode.
3. Press the MENU button.
   - ■ The menu list will appear.
4. Move the MENU SELECTOR to highlight MEMORY.
5. Push the MENU SELECTOR to enter the sub-menu.
6. Move the MENU SELECTOR to highlight PHOTO QUALITY in the submenu.
7. Push the MENU SELECTOR.
8. Using the MENU SELECTOR, select the image quality.
   - ■ Push the MENU SELECTOR to confirm the image quality.
   - ■ If you exit the sub-menu without pushing the MENU SELECTOR, the quality mode is not changed.
9. To exit, press the MENU button.









● Number of images on the Memory Stick

QUALITY	Still Image Size	8MB	16MB
SUPER FINE	1280 × 960 640 × 480	Approx.12 Approx.49	Approx.24 Approx.99
FINE	1280 × 960 640 × 480	Approx.24 Approx.99	Approx.49 Approx.199
NORMAL	1280 × 960 640 × 480	Approx.49 Approx.199	Approx.99 Approx.399

- The actual number that you can record varies depending on the image size.

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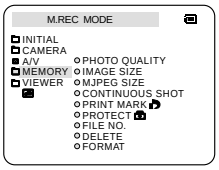
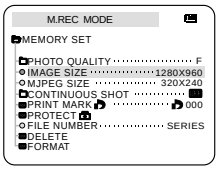
Digital Still Camera mode

Selecting the recording image size

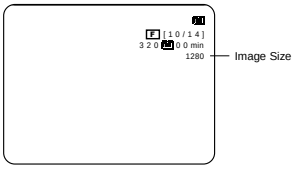
✤ Select the image size of still image to be recorded.



1. Set the mode switch to MEMORY STICK.
2. Set the power switch to the CAM mode.
3. Press the MENU button.
   ■ The menu list will appear
4. Move the MENU SELECTOR to highlight MEMORY and push the MENU SELECTOR.



5. Select IMAGE SIZE from the submenu and push the MENU SELECTOR.
   ■ The IMAGE SIZE toggles between 1280 x 960 and 640 x 480 with each push.
6. To exit the menu, press the MENU button.



Note

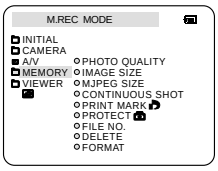
■ When still images are recorded at an image size of 1280 x 960 on your camcorder, images are sometimes not played back properly on other digital devices that do not support recording at an image size of 1280 x 960.

ENGLISH

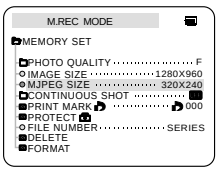
Digital Still Camera mode

Selecting the moving picture size

1. Set the mode switch to MEMORY STICK position.



2. Set the power switch to CAM mode.
3. Press the MENU button.
4. Move the MENU SELECTOR to highlight MEMORY.
5. Push the MENU SELECTOR to enter the sub-menu.
6. Move the MENU SELECTOR to highlight MJPEG SIZE.



7. Push the MENU SELECTOR button.
   ■ The MJPEG SIZE toggles between 320 × 240 - 160 × 120 with each push.

● **Maximum recording time of moving picture**

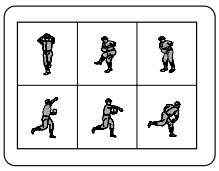
MJPEG SIZE	Maximum recording time
320 × 240	15 seconds
160 × 120	60 seconds

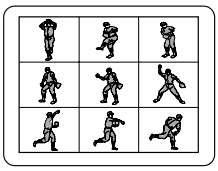
ENGLISH

Digital Still Camera mode

Recording images continuously

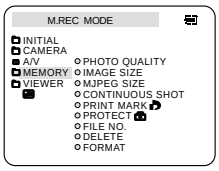
- ✤ You can record still images continuously.
- ✤ Select one of the three modes described below before recording.
  - ■ NORMAL( ) : Your camcorder records up to 2 still images in 1280 x 960 size or 6 still images in 640 x 480 size at about 0.7sec intervals.
  - ■ HIGH SPEED (HS) : Your camcorder records up to 9 still images in 640 x 480 size at about 0.07sec intervals.
    - Recording image size is 640 x 480 only
  - ■ MULTI SCENE (6, 9) : Your camcorder records 6 or 9 still images at about 0.4sec intervals and displays the images on a single page divided into six or nine boxes. Still images are recorded in 640 x 480 size.

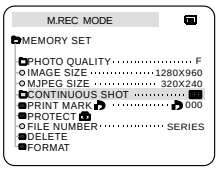


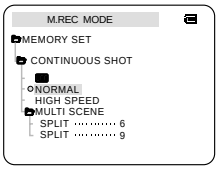


Select the CONTINUOUS SHOT

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to the CAM mode.
3. Press the MENU button and move the MENU SELECTOR to highlight MEMORY.
4. Move the MENU SELECTOR to highlight CONTINUOUS SHOT in the submenu.
5. Push the MENU SELECTOR.
6. Using the MENU SELECTOR, select the continuous shot.
   - ■ Push the MENU SELECTOR to confirm the continuous shot.
   - ■ If you exit the sub-menu without pushing the MENU SELECTOR, the continuous shot mode is not changed.
7. To exit, press the MENU button.







Notes

- ■ When selecting NORMAL
  - Recording continues up to the maximum number of still images during pressing PHOTO deeper. Release PHOTO button to STOP recording.
- ■ During recording images continuously, the flash does not work.
- ■ The number of images you can record continuously varies depending on the image size and the capacity of the Memory stick.

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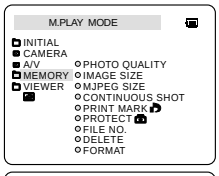
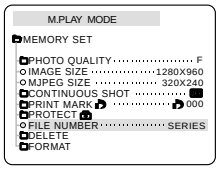
Digital Still Camera mode

Setting the File Number

- ✤ The images you take are automatically assigned file numbers from 0001 to 9999.
- ✤ Set the image file numbers so that they reset each time a Memory Stick is formatted, or so that they count up continuously.
  - ■ SERIES
    - Numbering is continuous between the Memory Sticks, so that the first file number assigned on a new Memory Stick is 1 more than the last file number assigned on the previous Memory Stick.
    - When the file number are set to SERIES, each image taken is assigned a different number, avoiding duplication of numbers. This is convenient when you want to manage your images on a PC.
    - We recommend keeping the file numbers set to SERIES.
  - ■ RESET
    When the Memory Stick is formatted, the file number resets to its default value (100-0001).
    If the Memory Stick already contains files, the next available number is assigned.

1. Set the mode switch to MEMORY STICK position.
2. Set the power switch to CAM or PLAYER mode.
3. Press the MENU button and move the MENU SELECTOR to highlight MEMORY.
4. Push the MENU SELECTOR to enter submenu.
5. Select FILE NUMBER from the sub-menu and push the MENU SELECTOR.
   - ■ The FILE NUMBER toggles between SERIES and RESET with each push.
6. To exit, press the MENU button.





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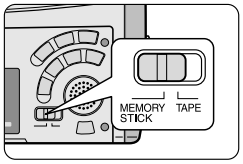
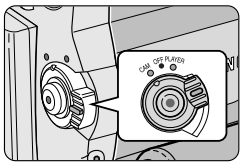
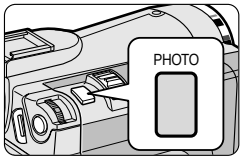
Digital Still Camera mode

Recording Still images to a Memory Stick in M.REC Mode.

❖ Audio cannot be recorded with still images onto the Memory Stick.

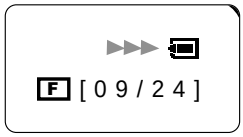






Recording images to a Memory Stick

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to CAM.
3. Press the PHOTO button lightly (about halfway down) and hold it.
   - During autofocus photo mark ( ) flashes in the display as the camcorder adjust the focus and it is displayed continuously when the camcorder is ready to take the still image.
   - If you do not wish to record, release the pressure from the button.
4. Press the PHOTO button fully down.
   - The still image is recorded to the Memory Stick.
   - While the camcorder is recording the still image, " ▶▶▶ " appears on the screen.



Notes

- The remote controller's PHOTO button has no halfway setting. Press the button fully and the camcorder immediately takes the image.
- Do not turn the power off, eject a Memory Stick or remove the battery pack during recording. The Memory Stick or its data may be damaged.
- If focusing is difficult with the autofocus mode when using the PHOTO function, focus manually.

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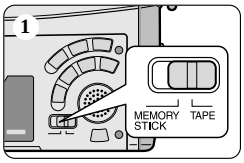
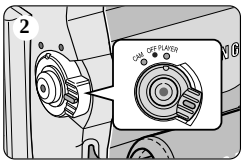
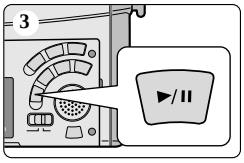
Digital Still Camera mode

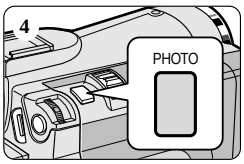
Recording an image from a cassette as a still image.

❖ You can record a still image from a cassette onto a Memory Stick.
❖ If you want to recorded multiple still images from a cassette to a Memory Stick, use the COPY function. (see page 91)
❖ The still images date/time will reflect the date and time the copies are made.
❖ The image size of a still image recorded from cassette onto a Memory Stick will be 640 × 480.









1. Set the mode switch to TAPE.
2. Set the power switch to PLAYER mode.
3. Play back the cassette.
4. Press the PHOTO button lightly (about halfway down), when the image you want to record appears.
   - The camcorder is set to playback pause(STILL) mode.
   - If you do not wish to record, release the PHOTO button, select the image again.
5. Press the PHOTO button fully down.
   - The still image is recorded to the Memory Stick.
   - While the camcorder is recording the still image, " ▶▶▶ " appears on the screen.

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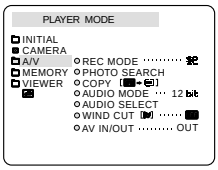
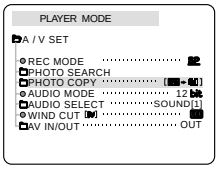
Digital Still Camera mode

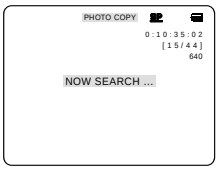
Copying still images from a cassette to Memory Stick

✤ You can copy still images recorded with PHOTO function on a cassette onto a Memory Stick.
- The still images date/time will reflect the date and time the copies are made.
- The image size of a still image copied from tape to Memory Stick will be 640 × 480.
- Before operation
  - Insert a recorded tape into your camcorder and rewind the tape.
  - Insert a Memory Stick into your camcorder.

1. Set the mode switch to TAPE.
2. Set the power switch to the PLAYER mode.
3. Press the MENU button.
4. Move the MENU SELECTOR to highlight A/V and push the MENU SELECTOR.
   - The submenu will appear.
5. Move the MENU SELECTOR to highlight PHOTO COPY and push the MENU SELECTOR.
   - All still images that recorded on a cassette will be copied to a Memory Stick.
6. The camcorder automatically performs the photo search to find still images and copying starts.
7. Press ■ (STOP) button to stop copying.
   - Copying stops when the cassette is finished or Memory Stick is full.







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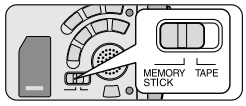
Digital Still Camera mode

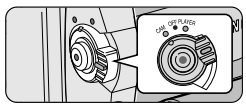
MJPEG RECORDING

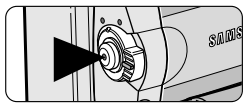
✤ Audio cannot be recorded onto the Memory Stick.

Saving the pictures captured by a camera as a moving picture file onto MEMORY STICK

1. Insert the MEMORY STICK into your camcorder.
2. Set the mode switch to MEMORY STICK position.
3. Set the power switch to CAM mode.
4. Press the START/STOP button.
   - When MJPEG SIZE in the menu setting is set to 320 x 240, the maximum recording time is 15 seconds. however, when MJPEG SIZE in the menu settings is set to 160 x 120, the maximum recording time is 60 seconds.
   - You can record a camera still image onto the memory stick by pressing the Photo button instead of the START/STOP button.
5. Press the START/STOP button to stop the recording.
   - The camcorder starts to write the moving picture to the Memory Stick when recording is finished.
   - While the camcorder is writing the moving picture, "▶▶▶" appears on the screen.

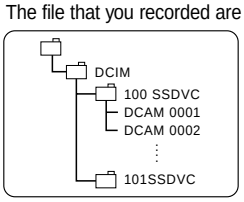






Notes

- The moving picture images that you recorded are saved in *.avi file format on the Memory Stick.
- You can record the moving picture images as 320 x 240 pixel or 160 x 120 pixel.
- The file that you recorded are saved in a following folder.



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Digital Still Camera mode

- The moving picture images on a Memory Stick are smaller size and lower definition than one on Tape.
- There could be any broken or mosaic pictures while playing the MJPEG moving picture images, but it is not malfunction.
- You can transfer MJPEG file to PC through DVC Media 6.0 using USB port on your PC.
  And then, play MJPEG file with a moving picture player program like a Microsoft Windows Media Player.
  (DVC Media 6.0 is included in the CD that is supplied).
- The following functions are not allowed in M.REC Mode.
  - EIS (Electronic Image Stabilizer), Digital Zoom, Fade, Program AE, Digital Effect, Slow Shutter
- While you record in Memory Stick, do not turn the power off, eject a Memory Stick or remove the battery pack.
  The Memory Stick or its data maybe damaged.
- Moving images recorded on the Memory Stick may not play on other manufacturer's camcorders.
- The MJPEG file recorded by another camcorder might not be allowed to play by this camcorder.

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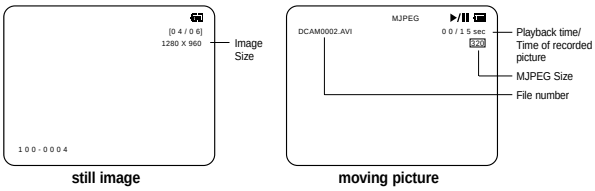
Digital Still Camera mode

Viewing Still images/Moving pictures

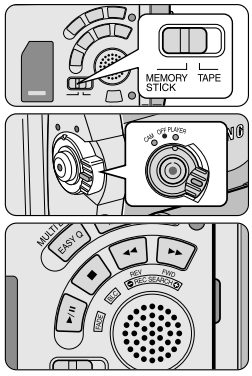
- ✤ You can playback and view still images/moving pictures recorded on the Memory Stick.
- ✤ There are 3 ways to view recorded images.
  - Single images/Moving pictures
  - Slide show : To view all images automatically and in consecutive order.
  - Multi display : To view 6 images at once.
- ✤ You cannot hear the sound.



still image **moving picture**

To view a Single image

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to PLAYER mode.
   - The last still image/moving picture recorded appears in the display.
     - If there are no recorded still images/moving pictures on the Memory Stick, NO STORED IMAGE! and will display on the screen.
3. Using the ▶▶ (FWD) and ◀◀ (REV) buttons, search for the desired still images/moving pictures.
   - To view the next still image/moving picture: press the ▶▶ (FWD) button.
   - To view the previous still image/moving picture: press the ◀◀ (REV) button.
   - Pressing ▶▶ (FWD) when you are on the last still image/moving picture will take you to the first still image and pressing ◀◀ (REV) when you are on the first still image/moving picture will take you to the last still image/moving picture.
   - Keep pressing ▶▶ (FWD) or ◀◀ (REV) to search for an still image/moving picture quickly.
   - Moving picture: Pressing ▶/II (PLAY/STILL) plays back the moving picture and will show first scene as a still image when playback ends.
     - Pressing ▶/II (PLAY/STILL) during playback will stop the moving picture and the scene is shown as a still image.
       Pressing ▶/II (PLAY/STILL) again will restart the playback.



Notes

- There could be any broken or mosaic pictures while playing the MJPEG moving pictures, but it is not malfunction.
- The moving pictures that you recorded in the Memory Stick might not be allowed to play by the camcorder of another brands.
- The MJPEG file recorded by another camcorder might not be allowed to play by this camcorder.
- When reading the Memory Stick with large file size, it takes some more time.
- You can transfer MJPEG file to PC through DVC Media 6.0 using USB port on your PC. And then, play MJPEG file with a moving picture player program like a Microsoft Windows Media Player. (DVC Media 6.0 is included in the CD that is supplied)

ENGLISH

Digital Still Camera mode

To view a slide show

1. Set the mode switch to MEMORY STICK.

2. Set the power switch to PLAYER mode.
   - The last recorded still image/moving picture appears

3. Press the S.SHOW button.
   - All images will be played back consecutively for 3~4 seconds each.

4. To stop the slide show, press the S.SHOW button again.

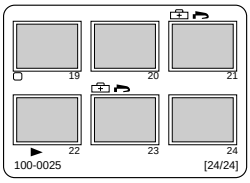
To view the Multi Display

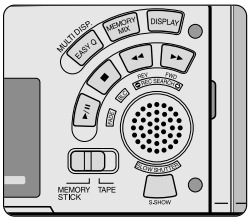
1. Set the mode switch to MEMORY STICK.

2. Set the power switch to PLAYER mode.
   - The last recorded still image/moving picture appears.

3. To view six stored still image/moving picture on single screen, press the MULTI DISP. button.
   - A selection mark (▶) appears under the still image/moving picture.
   - Moving pictures will be displayed with the first scene as a still image, indicated by a picture mark (▢).
   - Move the MENU SELECTOR to select a still image/moving picture.
   - To display the previous six images, press the ◀◀ (REV).
   - To display the next six images, press the ▶▶ (FWD).

4. To return to single playback mode, press the MULTI DISP. button again.
   - The still image/moving picture you have marked fills the whole display.





ENGLISH

Digital Still Camera mode

Marking still images for printing

- This camcorder supports the DPOF (Digital Print Order Format) print format.
- You can automatically print still images recorded on a Memory Stick with a printer supporting DPOF.
- There are 2 ways to make a PRINT MARK.
  - THIS FILE : You can set a print mark on the photo image displayed on the LCD.
  - ALL FILES : To print 1 copy each of all of the stored still images.

1. Set the mode switch to MEMORY STICK.

2. Set the power switch to PLAYER.
   - The last recorded image appears.

3. Using the ▶▶ (FWD) and ◀◀ (REV) buttons, search for the still image that you want to mark.

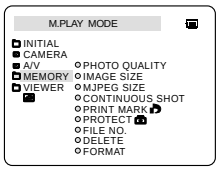
4. Press the MENU button.

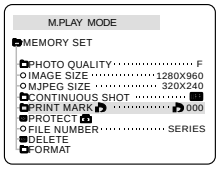
5. Move the MENU SELECTOR to highlight MEMORY and push the MENU SELECTOR.
   - The MEMORY SET submenu will appear.

6. Move the MENU SELECTOR to highlight PRINT MARK, push the MENU SELECTOR.

7. Use the MENU SELECTOR to select either THIS FILE or ALL FILES and push the MENU SELECTOR.

8. Use the MENU SELECTOR to select the quantity and push the MENU SELECTOR.





Notes

- When you setup the PRINT MARK option to ALL FILES, 999 files from the current file are set to 1 or 0.
- The ALL FILES option may require extended operation time depending on the number of stored still images.
- You cannot write print marks on moving pictures.

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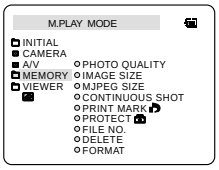
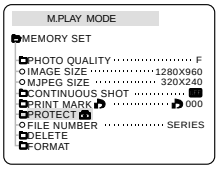
Digital Still Camera mode

Protection from accidental erasure

✤ You can protect important still images/moving pictures from accidental erasure.
- If you execute FORMAT, all still images/moving pictures including protected images will be erased.

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to PLAYER.
   - The last recorded still image/moving picture appears.
   - If there are no recorded still images/moving pictures on the Memory Stick, NO STORED IMAGE! and will display on the screen.
3. Using the ▶▶ (FWD) and ◀◀ (REV) buttons, search for the still image/moving picture that you want to protect.
4. Press the MENU button.
5. Move the MENU SELECTOR to highlight MEMORY and push the MENU SELECTOR.
   - The submenu of MEMORY SET will appear.
6. Move the MENU SELECTOR to highlight PROTECT and push the MENU SELECTOR.
7. Push the MENU SELECTOR to set PROTECT to ON or OFF.
   - THIS FILE : protects the currently selected file from erasure.
8. Using the ▶▶ (FWD) and ◀◀ (REV) buttons, search for the still image/moving picture that you wish to protect.
9. To exit the menu, press the MENU button.





Note

- If the write protect tab on the Memory Stick is set to LOCK, you cannot carry out image protection.

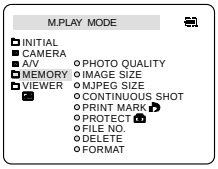
ENGLISH

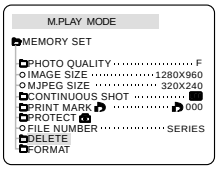
Digital Still Camera mode

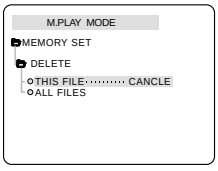
Deleting Still images/Moving pictures

✤ You can erase the still images/moving pictures recorded on the Memory Stick.
✤ If you want to delete protected still images/moving pictures, you must first deactivate the image protection.
✤ An image which has been deleted cannot be recovered.

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to PLAYER.
3. Using the ▶▶ (FWD) and ◀◀ (REV) buttons, search for the still image/moving picture that you want to delete.
4. Press the MENU button.
5. Move the MENU SELECTOR to highlight MEMORY and push the MENU SELECTOR.
   - The MEMORY SET submenu will appear.
6. Move the MENU SELECTOR to highlight DELETE and push the MENU SELECTOR.
   - Using the MENU SELECTOR, select either THIS FILE or ALL FILES and push the MENU SELECTOR.
   - THIS FILE : deletes only the file currently selected.
   - ALL FILES : deletes all files stored in the Memory Stick.
7. A box will appear to verify whether you wish to delete the still image/moving picture.
   - Using the MENU SELECTOR, select the item.
   - EXECUTE : deletes the selected still images/moving pictures.
   - CANCEL : does not delete the selected still images/moving pictures and returns to the previous menu.







Note

- If you try to delete a protected image, “PROTECT!” appears on the screen.

ENGLISH

Digital Still Camera mode

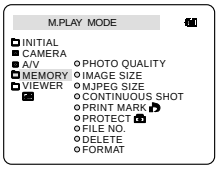
Formatting the Memory Stick

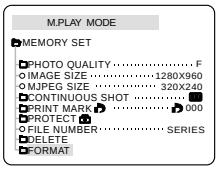
- ✤ You can use the MEMORY FORMAT functions to completely delete all still images/moving pictures and options on the Memory Stick, including protected still images/moving pictures.
- ✤ The format function restores the Memory Stick to its initial state.
- ✤ The Memory Stick supplied with this camcorder has been formatted already.

Attention

- ✤ If you execute the MEMORY FORMAT function, all still images/moving pictures will be erased completely and erased still images/moving pictures cannot be recovered.

1. Set the mode switch to MEMORY STICK.
2. Set the power switch to PLAYER mode.
3. Press the MENU button.
4. Move the MENU SELECTOR to highlight MEMORY and push the MENU SELECTOR.
   - ■ The sub menu will appear.
5. Select FORMAT from the list and push the MENU SELECTOR.
6. "ALL FILES ARE DELETED! FORMAT REALLY?" appears on the screen.
7. Using the MENU SELECTOR, select the item.
   - ■ NO : To return to previous menu
   - ■ YES : To start formatting.
8. Push the MENU SELECTOR.
9. To exit the menu, push the MENU button.





Note

■ If you want to format the Memory Stick on your PC, use only the "Memory Stick formatter" supplied with the software CD.

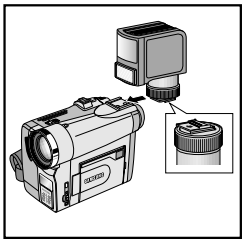
ENGLISH

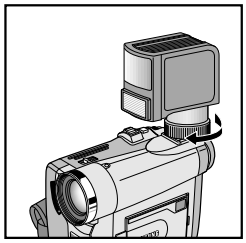
Smart Shoe

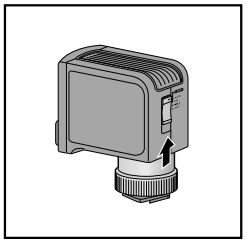
Using the Smart Shoe

- ✤ You can use to attach an optional accessory to the camcorder's Smart Shoe.
- ✤ The accessory is powered by the camcorder's power supply.
- ✤ Turn the camcorder's power off before attaching/removing the accessory to the Smart Shoe.
- ✤ Types of optional accessories for Smart Shoe.
  - ■ VL-S1FL Video Light/Flash
  - ■ ZM-EC1 Gun Zoom Mic

  ex) Using the VL-S1FL Video Light/Flash(optional)







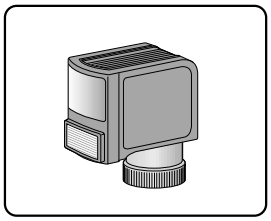
1. Slide the VL-S1FL(Video Light/Flash) onto the Smart Shoe and tighten with shoe lock.
   - ■ Slide the VL-S1FL onto the camcorder until it clicks securely into place.
   - ■ Make sure that the accessory does not come disconnected when turning the shoe lock.
2. Set the camcorder to CAM or M.REC mode.
3. Move the Video Light's power switch to AUTO or ON.

ENGLISH

Smart Shoe

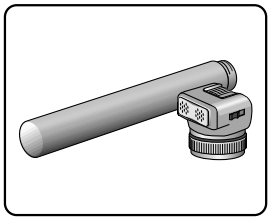
VL-S1FL Video Light/Flash

Attach the Video Light/Flash to a camcorder when recording in dark places.
When recording a PHOTO, you can take natural-looking flash pictures with appropriate illumination using the Flash.



ZM-EC1 Gun Zoom Mic

This is a highly sensitive microphone that can be switched between functioning as a directional microphone (Gun mode) or variable microphone (Zoom mode).



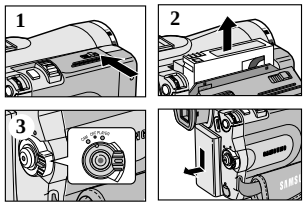
ENGLISH

Maintenance

After finishing a recording

- ✤ At the end of a recording you must remove the power source.
- ✤ When recording with a Lithium Ion Battery Pack, leaving the pack on the camcorder can reduce the life span of the battery. Hence, it should be removed from the camcorder.

1. Slide the TAPE EJECT switch in the direction of the arrow.
   - ■ Opening the cassette door ejects the tape automatically.
   - ■ Please wait while the tape is completely ejected.
2. After removing the tape, close the door and store the camcorder in a dust free environment.
   - ■ Dust and other foreign materials can cause square-shaped noise or jerky images.
3. Set the power switch to the OFF mode.
4. Disconnect the power source or remove the Lithium Ion Battery Pack.
   - ■ Hold down the BATTERY RELEASE button and slide the battery pack in the direction of the arrow.



ENGLISH

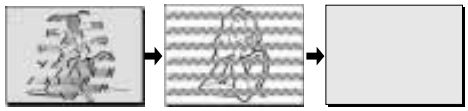
Maintenance

Cleaning and Maintaining the Camcorder

Cleaning the Video Heads

To ensure normal recording and clear pictures, clean the video heads
when the playback pictures display square block-shaped noise or distortion, or a blue screen appears.

1. Set the power switch to PLAYER mode.
2. Insert the cleaning tape.
3. Press the ▶/II (PLAY/STILL) button.
4. Press the ■ (STOP) button after 10 seconds.



Notes

- Check the quality of the picture using a videocassette.
  If the picture quality has not improved, repeat the operation.
  If the problem continues, contact your local authorized service center.
- Clean the video heads with a dry type cassette cleaner.

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ENGLISH

Maintenance

Using Your Camcorder Abroad

✤ Each country or region has its own electric and colour systems.
✤ Before using your camcorder abroad, check the following items.

Power sources

- You can use your camcorder in any country or area with the supplied AC Power Adapter within 100V to 240V, 50/60 Hz.
- Use a commercially available AC plug Adapter, if necessary, depending on the design of the local wall outlet.

Colour system

- You can view your recording in the viewfinder.
  However, to view it on a television or copy it to a videocassette recorder, the television or VCR must be PAL-compatible and have the appropriate audio/video jacks.
  Otherwise, you may need to use a transcoder.

● **PAL-compatible Countries/Regions**
Australia, Austria, Belgium, Bulgaria, China, CIS, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Great Britain, Holland, Hong Kong, Hungary, India, Iran, Iraq, Kuwait, Libya, Malaysia, Mauritius, Norway, Romania, Saudi Arabia, Singapore, Slovak Republic, Spain, Sweden, Switzerland, Syria, Thailand, Tunisia, etc.

● **NTSC-compatible Countries/Regions**
Bahamas, Canada, Central America, Japan, Korea, Mexico, Philippines, Taiwan, United States of America, etc.

Note

You can make recordings with your camcorder and view pictures on the LCD from anywhere in the world.

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1. Precautions

1. Be sure that all of the built-in protective devices are replaced. Restore any missing protective shields.

2. When reinstalling the chassis and its assemblies, be sure to restore all protective devices, including : control knobs and compartment covers.

3. Make sure that there are no cabinet openings through which people--particularly children --might insert fingers and contact dangerous voltages. Such openings include the spacing between the picture tube and the cabinet mask, excessively wide cabinet ventilation slots, and improperly fitted back covers.

   If the measured resistance is less than 1.0 megohm or greater than 5.2 megohms, an abnormality exists that must be corrected before the unit is returned to the customer.

4. Leakage Current Hot Check (See Fig. 1-1) :
   Warning : Do not use an isolation transformer during this test. Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI C101.1, Leakage Current for Appliances), and Underwriters Laboratories (UL Publication UL1410, 59.7).

5. With the unit completely reassembled, plug the AC line cord directly the power outlet. With the unit's AC switch first in the ON position and then OFF, measure the current between a known earth ground (metal water pipe, conduit, etc.) and all exposed metal parts, including : antennas, handle brackets, metal cabinets, screwheads and control shafts. The current measured should not exceed 0.5 milliamp. Reverse the power-plug prongs in the AC outlet and repeat the test.

6. X-ray Limits :
   The picture tube is designed to prohibit X-ray emissions. To ensure continued X-ray protection, replace the picture tube only with one that is the same type as the original.

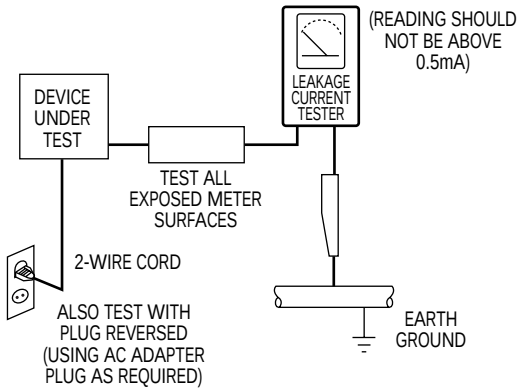
(READING SHOULD NOT BE ABOVE 0.5mA)
LEAKAGE CURRENT TESTER
DEVICE UNDER TEST
TEST ALL EXPOSED METER SURFACES
2-WIRE CORD
ALSO TEST WITH PLUG REVERSED (USING AC ADAPTER PLUG AS REQUIRED)
EARTH GROUND

Fig. 1-1 AC Leakage Test

7. Antenna Cold Check :
   With the unit's AC plug disconnected from the AC source, connect an electrical jumper across the two AC prongs. Connect one lead of the ohmmeter to an AC prong.
   Connect the other lead to the coaxial connector.

8. High Voltage Limit :
   High voltage must be measured each time servicing is done on the B+, horizontal deflection or high voltage circuits.

   Heed the high voltage limits. These include the X-ray protection Specifications Label, and the Product Safety and X-ray Warning Note on the service data schematic.

9. Some semiconductor ("solid state") devices are easily damaged by static electricity.
   Such components are called Electrostatically Sensitive Devices (ESDs); examples include integrated circuits and some field-effect transistors. The following techniques will reduce the occurrence of component damage caused by static electricity.

10. Immediately before handling any semiconductor components or assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging Wrist-strap device. (Be sure to remove it prior to applying power--this is an electric shock precaution.)

11. High voltage is maintained within specified limits by close-tolerance, safety-related components and adjustments. If the high voltage exceeds the specified limits, check each of the special components.

12. Design Alteration Warning :
    Never alter or add to the mechanical or electrical design of this unit. Example : Do not add auxiliary audio or video connectors.
    Such alterations might create a safety hazard. Also, any design changes or additions will void the manufacturer's warranty.

13. Hot Chassis Warning :
    Some TV receiver chassis are electrically connected directly to one conductor of the AC power cord. If an isolation transformer is not used, these units may be safely serviced only if the AC power plug is inserted so that the chassis is connected to the ground side of the AC source.

    To confirm that the AC power plug is inserted correctly, do the following : Using an AC voltmeter, measure the voltage between the chassis and a known earth ground. If the reading is greater than 1.0V, remove the AC power plug, reverse its polarity and reinsert. Re-measure the voltage between the chassis and ground.

14. Some TV chassis are designed to operate with 85 volts AC between chassis and ground, regardless of the AC plug polarity. These units can be safely serviced only if an isolation transformer inserted between the receiver and the power source.

15. Never defeat any of the B+ voltage interlocks. Do not apply AC power to the unit (or any of its assemblies) unless all solid-state heat sinks are correctly installed.

16. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the positive lead; always remove the instrument's ground lead last.

17. Observe the original lead dress, especially near the following areas : Antenna wiring, sharp edges, and especially the AC and high voltage power supplies. Always inspect for pinched, out-of-place, or frayed wiring. Do not change the spacing between components and the printed circuit board. Check the AC power cord for damage. Make sure that leads and components do not touch thermally hot parts.

18. Picture Tube Implosion Warning :
    The picture tube in this receiver employs "integral implosion" protection. To ensure continued implosion protection, make sure that the replacement picture tube is the same as the original.

19. Do not remove, install or handle the picture tube without first putting on shatterproof goggles equipped with side shields. Never handle the picture tube by its neck. Some "in-line" picture tubes are equipped with a permanently attached deflection yoke; do not try to remove such "permanently attached" yokes from the picture tube.

20. Product Safety Notice :
    Some electrical and mechanical parts have special safety-related characteristics which might not be obvious from visual inspection. These safety features and the protection they give might be lost if the replacement component differs from the original--even if the replacement is rated for higher voltage, wattage, etc.

    Components that are critical for safety are indicated in the circuit diagram by shading, (⚠ or ⚠).
    Use replacement components that have the same ratings, especially for flame resistance and dielectric strength specifications. A replacement part that does not have the same safety characteristics as the original might create shock, fire or other hazards.

2. Product Specifications

	Operation	Description
System	Video signal	PAL
	Video recording system	2 rotary heads, Helical scanning system
	Audio recording system	Rotary heads, PCM system
	Usable cassette	Digital video tape (6.35mm width): Mini DV cassette
	Tape speed	SP: approx. 18.83mm/s LP: approx. 12.57mm/s
	Tape recording time	SP: 60 minutes (when using DVM 60), LP: 90 minutes (when using DVM 60)
	FF/REW time	Approx. 150 sec. (using DVM60 tape)
	Image device	CCD (Charge Coupled Device)
	Lens	F2.0 12x(Optical), 800x(Digital) Electronic zoom lens
	Filter diameter	Ø30
LCD monitor/Viewfinder	Size/dot number	2.5inchs 123k(VP-D93(i)/D97(i) only), 211k(VP-D99(i) only)
	LCD monitor Method	TFT LCD
	Viewfinder	0.24" B/W LCD(VP-D93(i)/D97(i) only), Colour LCD(VP-D99(i) only)
Connectors	Video output	1Vp-p (75Ω terminated)
	S-video output	Y: 1Vp-p, 75Ω, C: 0. 286Vp-p, 75Ω
	Audio output	-7.5dBs (600Ω terminated)
	DV input/output	VP-DXXi: 4pin special in/out connector, VP-DXX: out only
	USB output	Mini-B type connector
	External mic	Ø3.5 stereo
	Earphone	Ø3.5 stereo
General	Power source	DC 8.4V, Lithium Ion Battery Pack 7.4V
	Power source type	Lithium Ion Battery Pack, Power supply (100V~240V) 50/60Hz
	Power consumption (Recording)	5.9W(LCD), 4.7W(EVF)
	Operating temperature	0˚~40˚C (32˚F~104˚F)
	Storage temperature	-20˚C ~ 60˚C (-4˚F ~ 140˚F)
	External dimension	Length 126.5mm, Height 93.5mm, Width 75mm
	Weight	485g (Except for Lithium Ion Battery Pack and tape)
	Built-in MIC	Omni-directional stereo condenser microphone
	Remote control	Indoors: greater than 15m (straight line), Outdoors: about 5m (straight line)

The technical specifications and design may be changed without notice.

MEMO

11. Schematic Diagrams

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Note

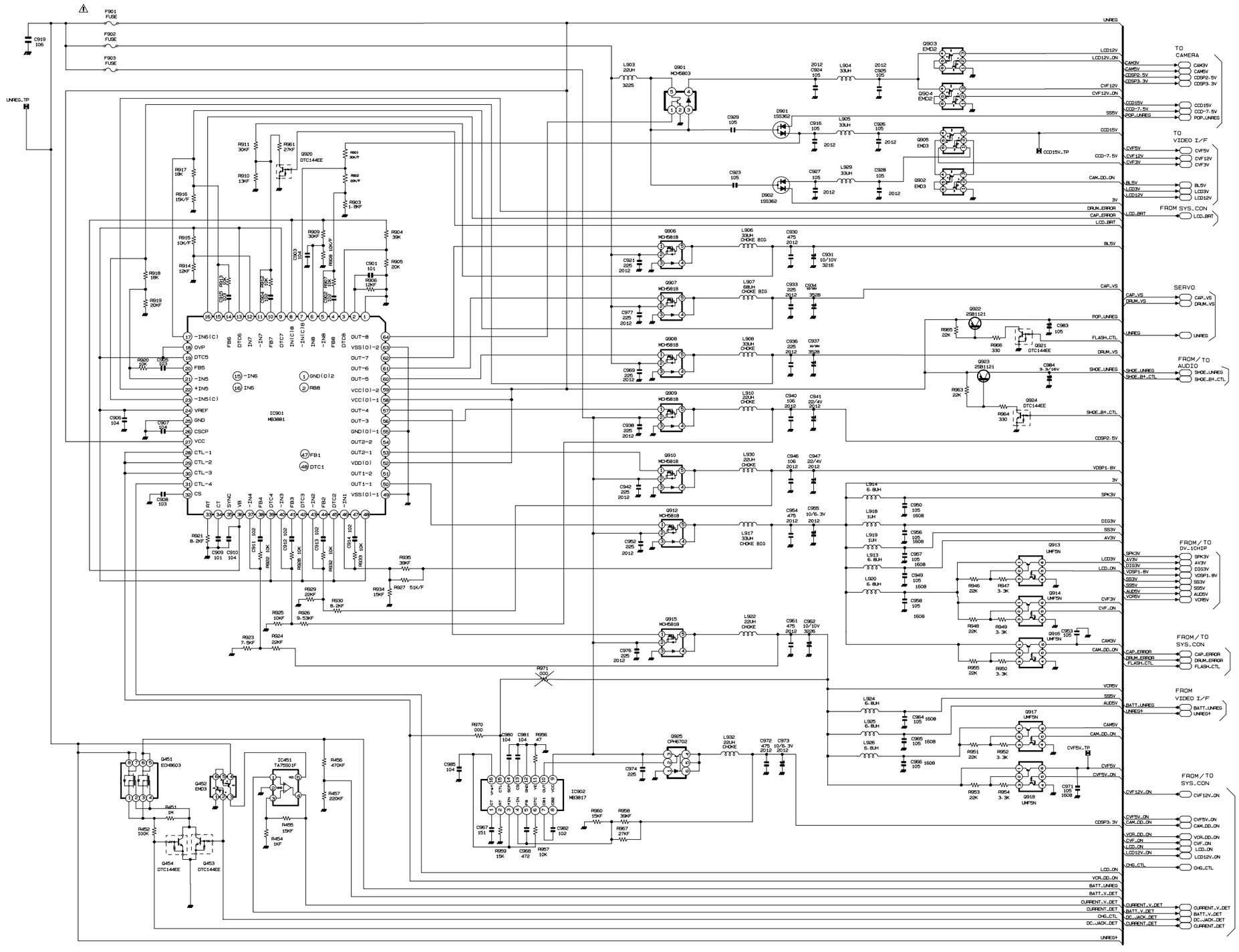
For schematic Diagram
- Resistors are in ohms, 1/8W unless otherwise noted.

Special note :
Most semiconductor devices are electrostatically sensitive and therefore require the special handling techniques described under the "electrostatically sensitive (ES) devices" section of this service manual.

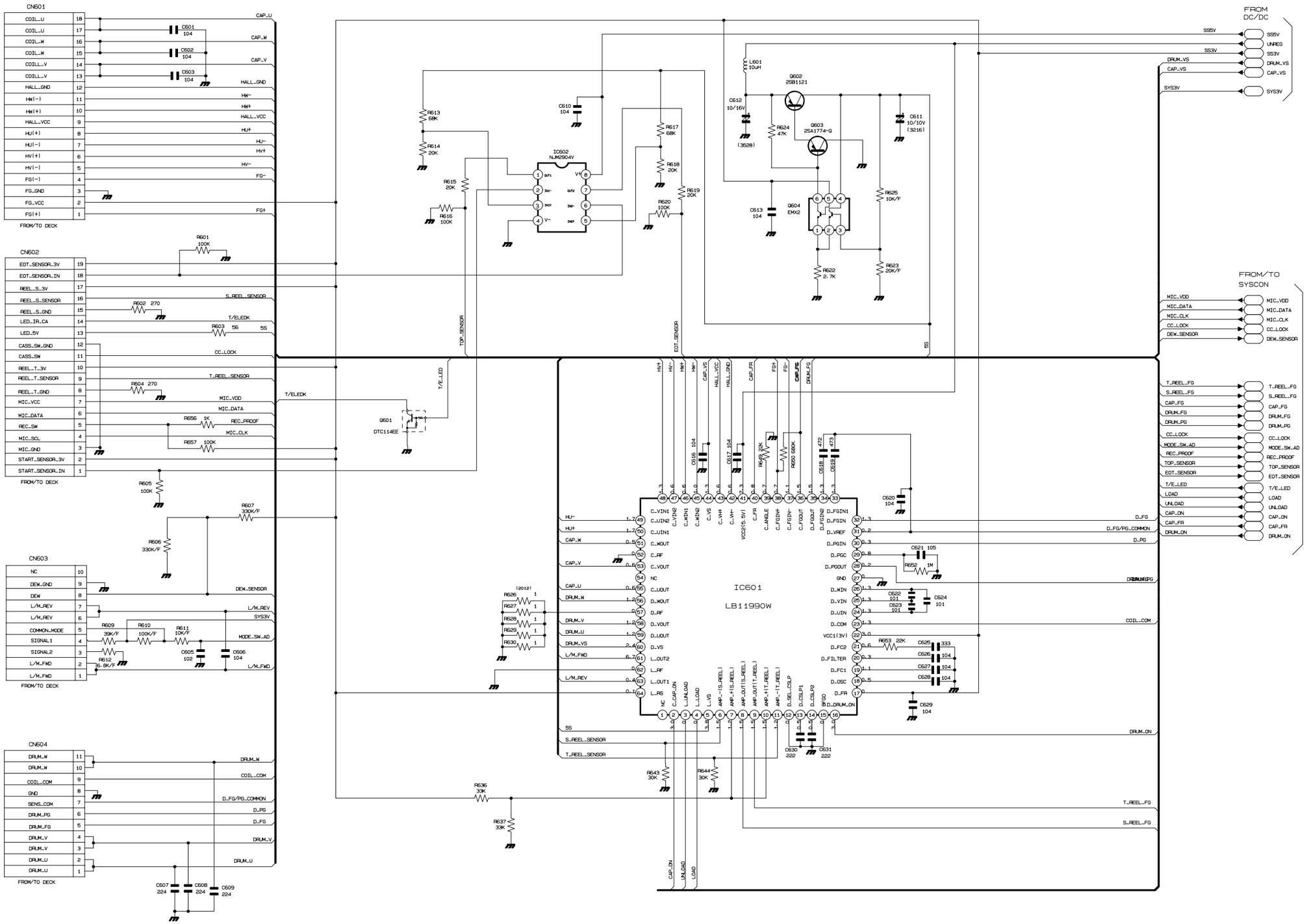
Note :
Do not use the part number shown on this drawing for ordering. The correct part number is shown in the parts list (may be slightly different or amended since this drawing was prepared).

Important safety notices :
Components identified with the mark ⚠ have the special characteristics for safety. When replacing any of these components.
Use only the same type.

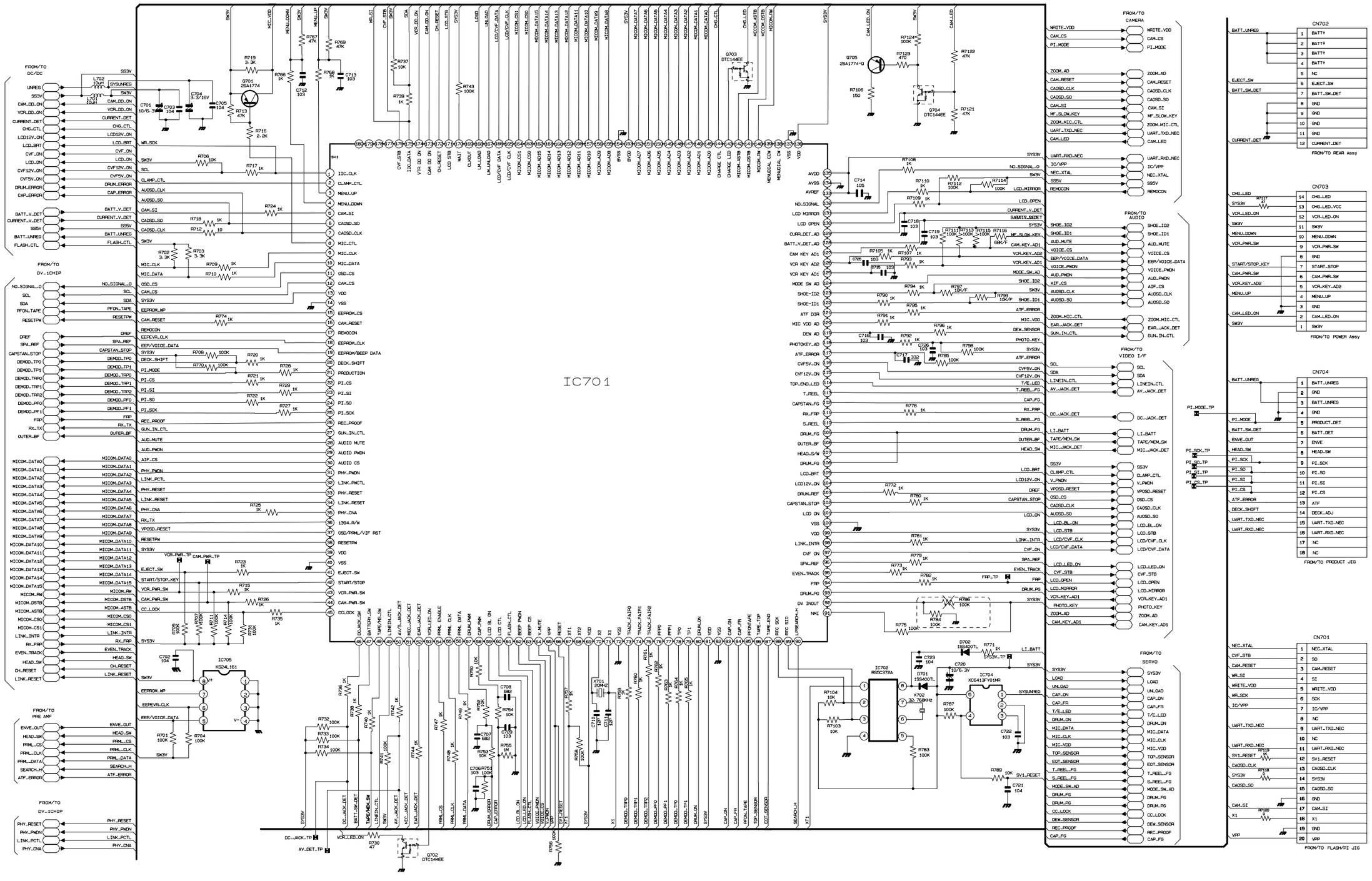
11-1 DC/DC Converter (Main PCB)



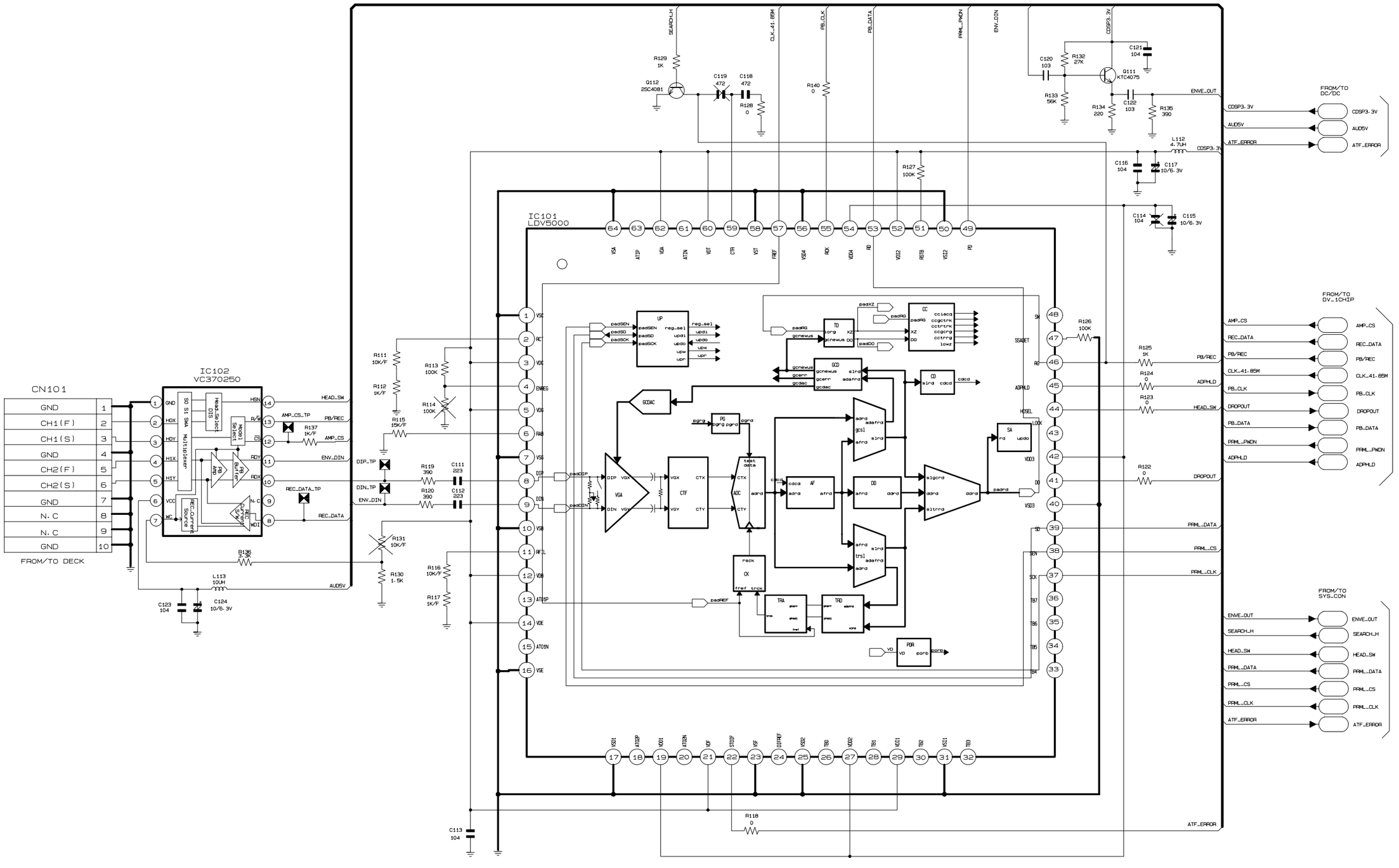
11-2 Servo (Main PCB)



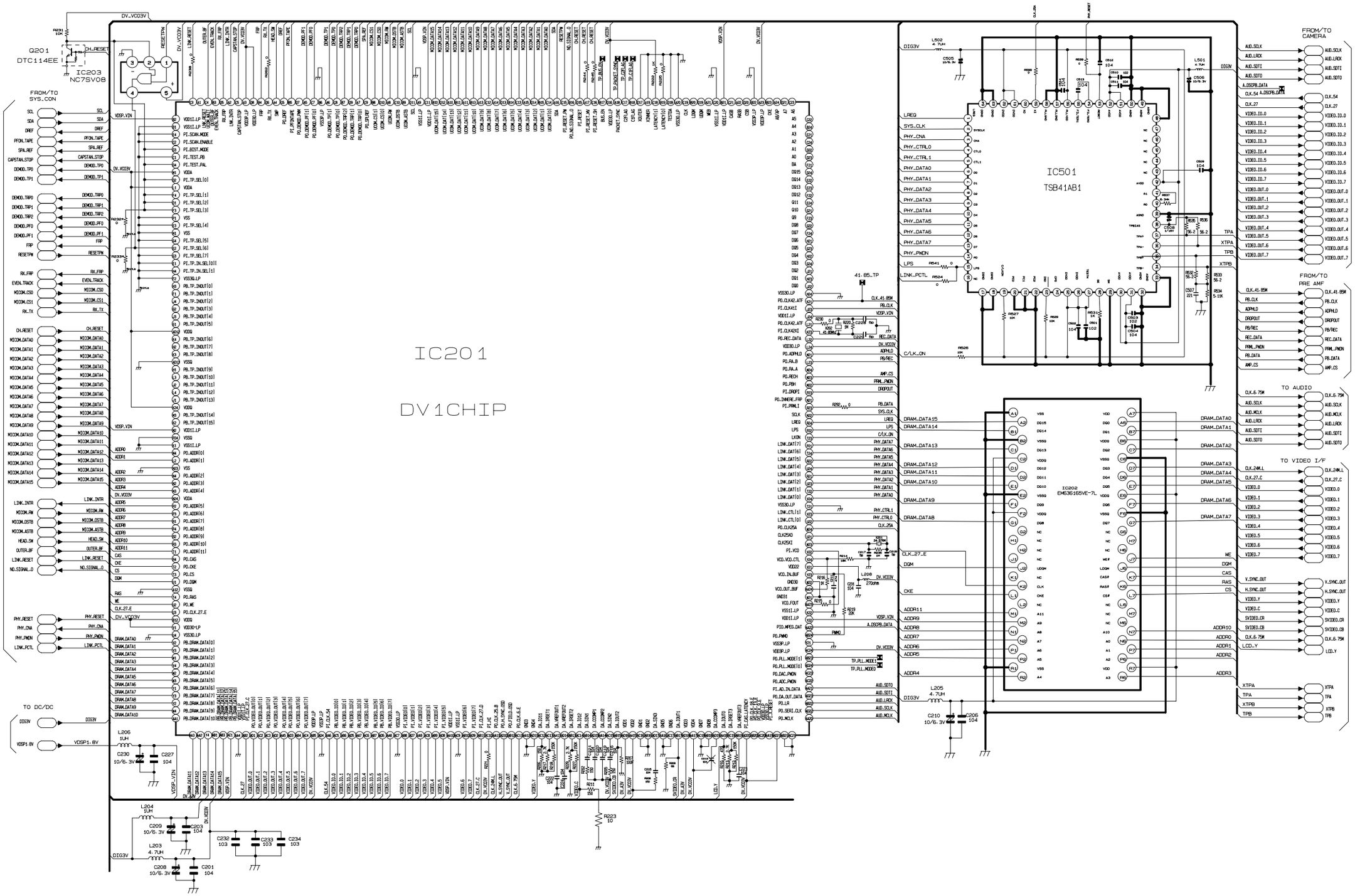
11-3 System Control (Main PCB)



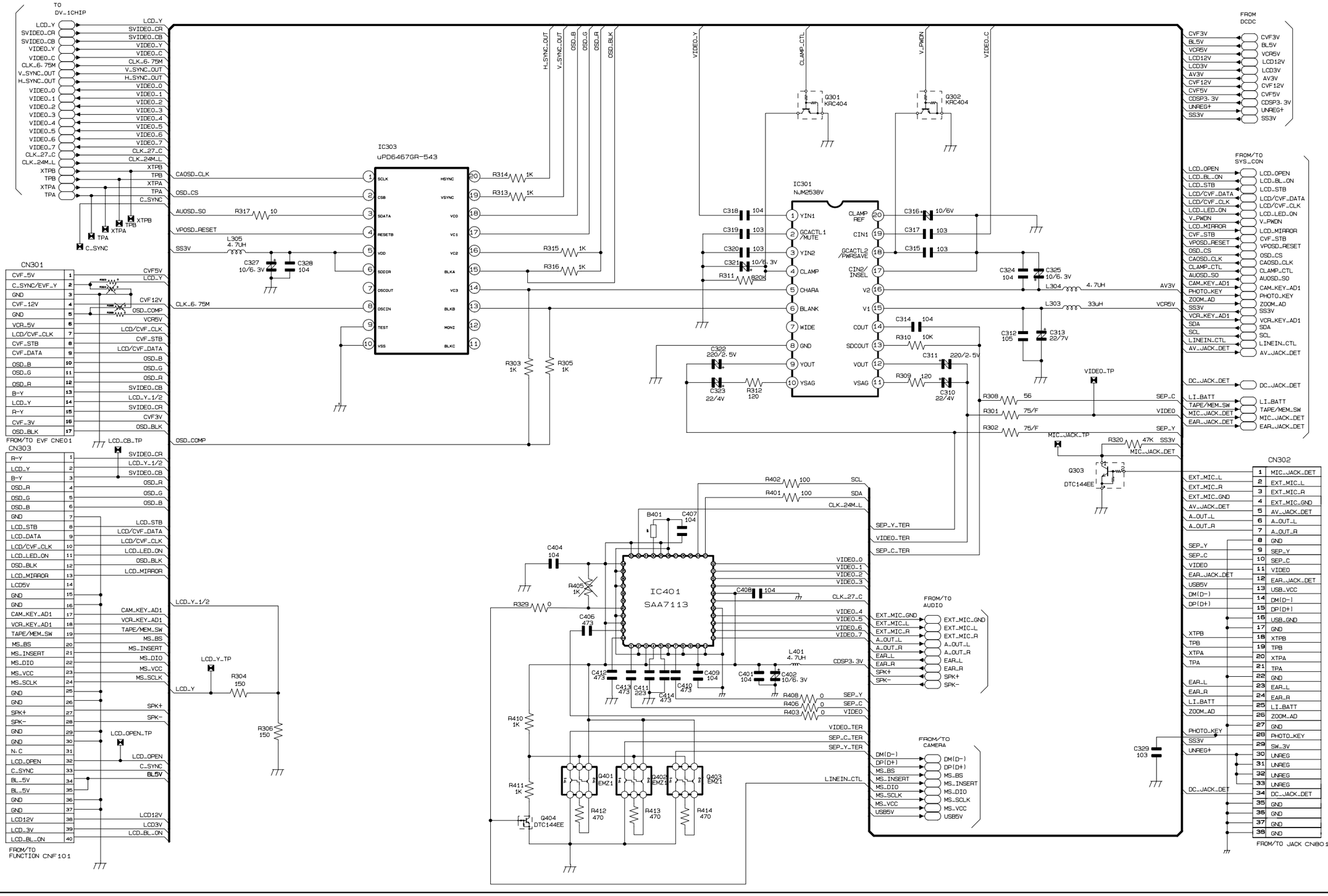
11-4 Pre Amp (Main PCB)



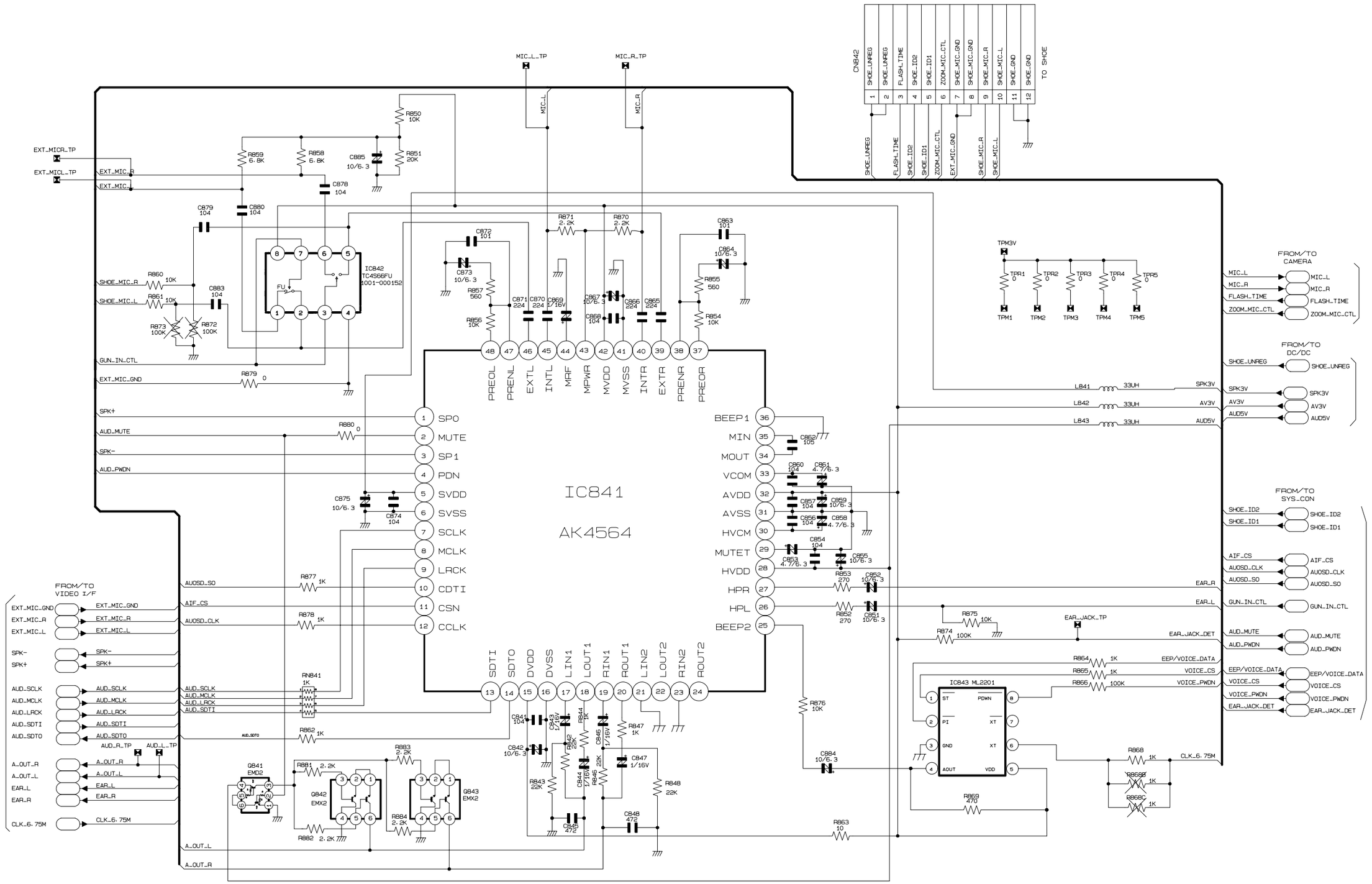
11-5 DV-1Chip (Main PCB)



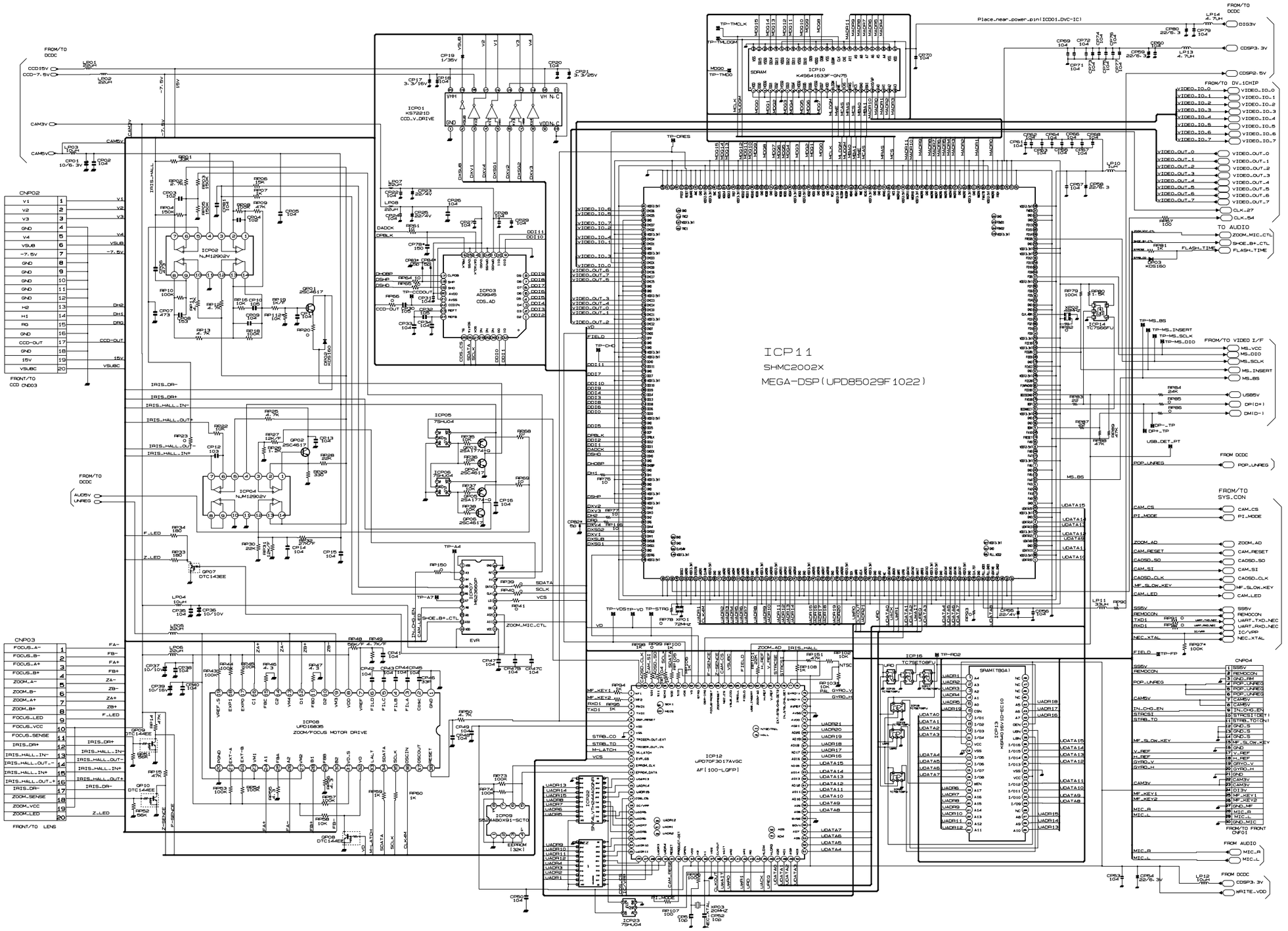
11-6 Video-Interface (Main PCB)



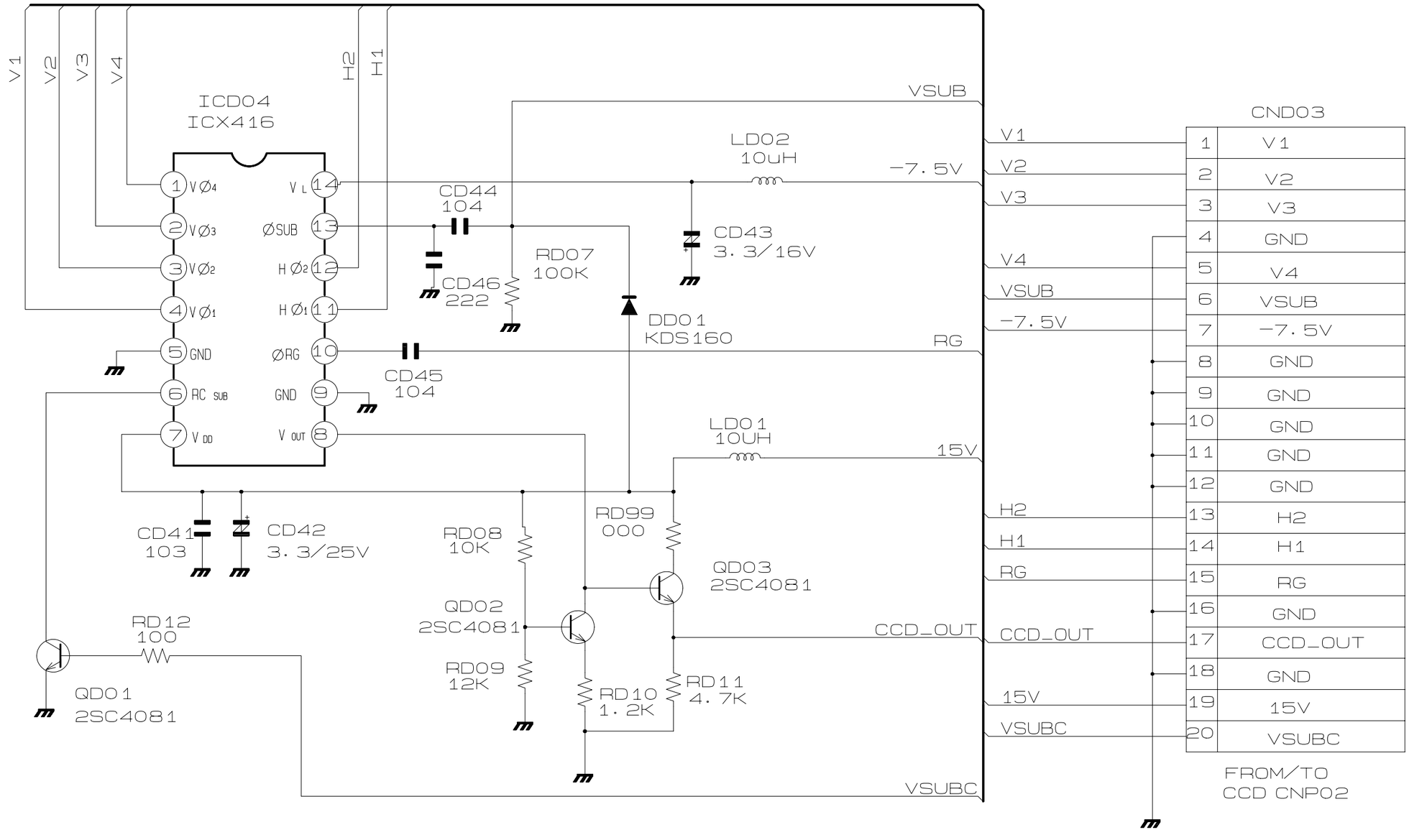
11-7 Audio (Main PCB)



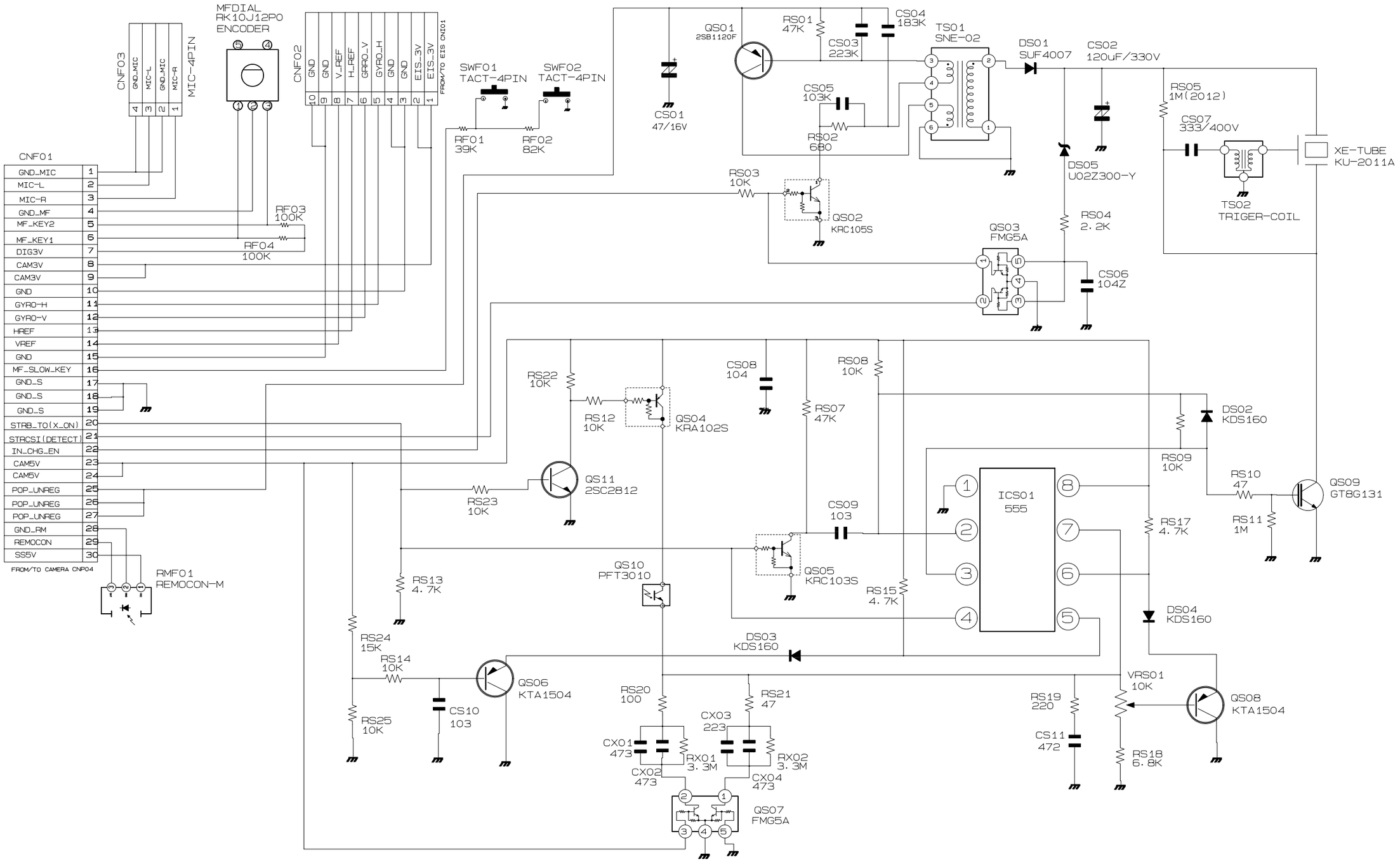
11-8 Camera (Main PCB)



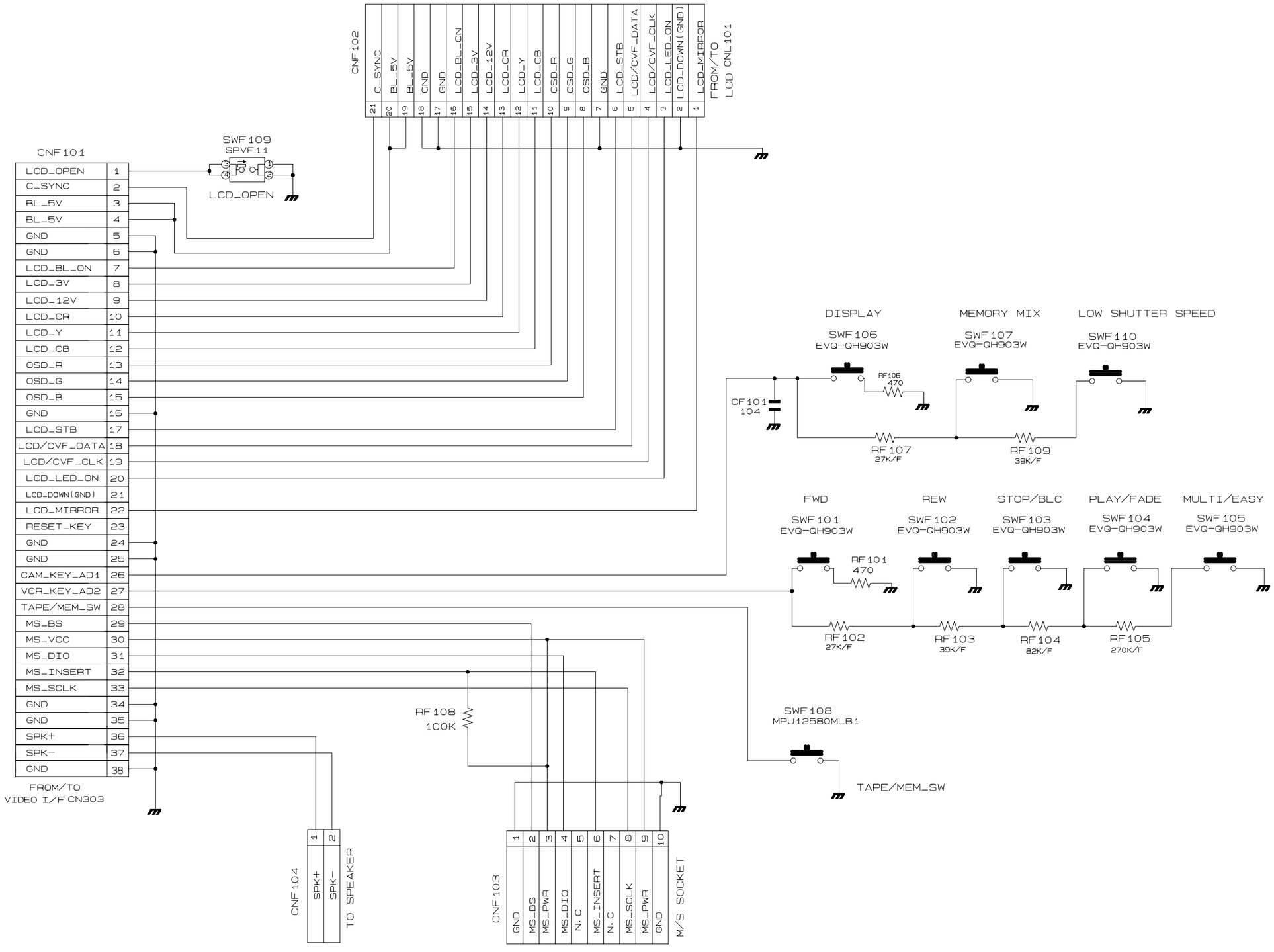
11-9 CCD (CCD PCB)



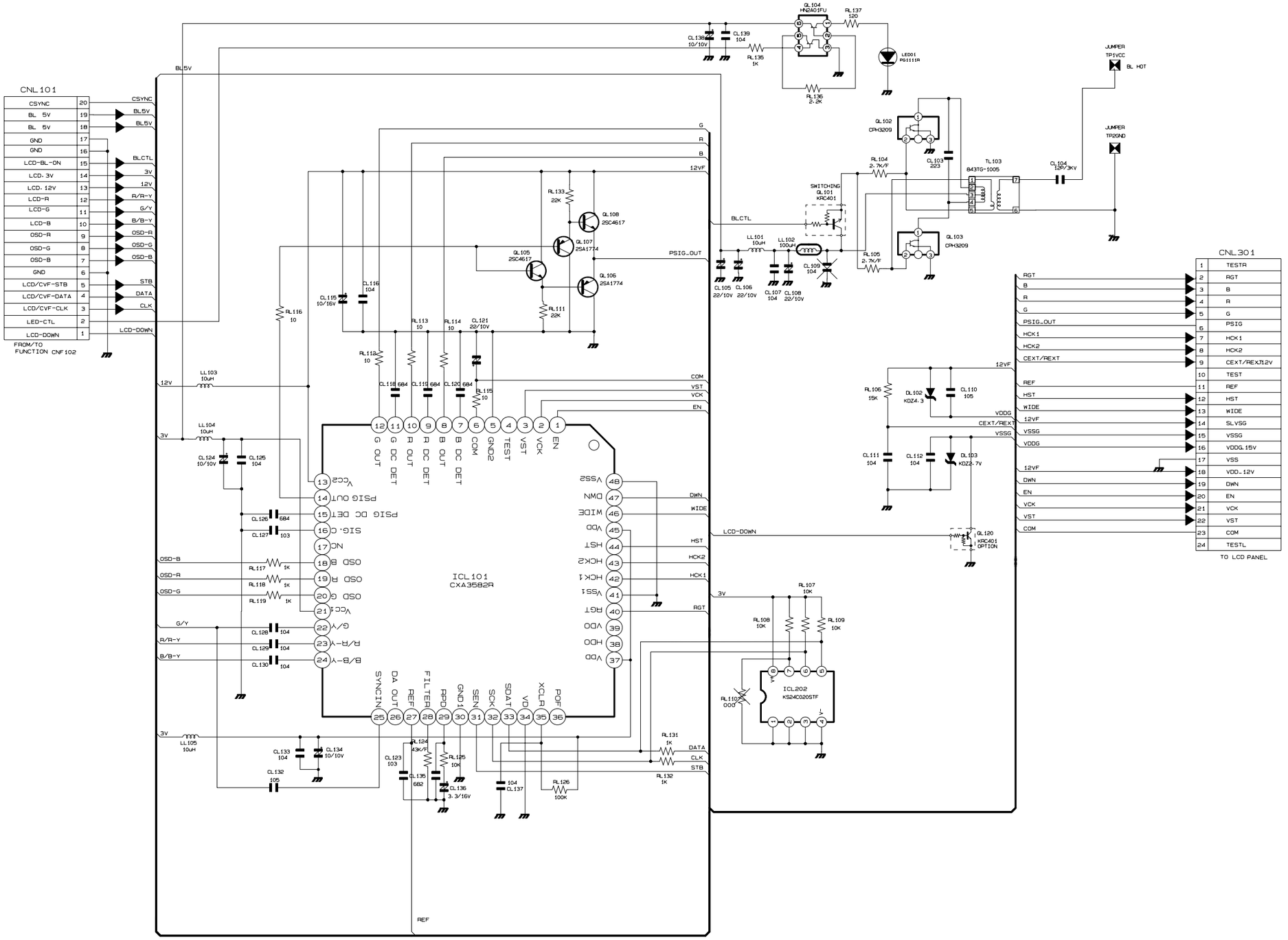
11-10 Front (Front PCB)



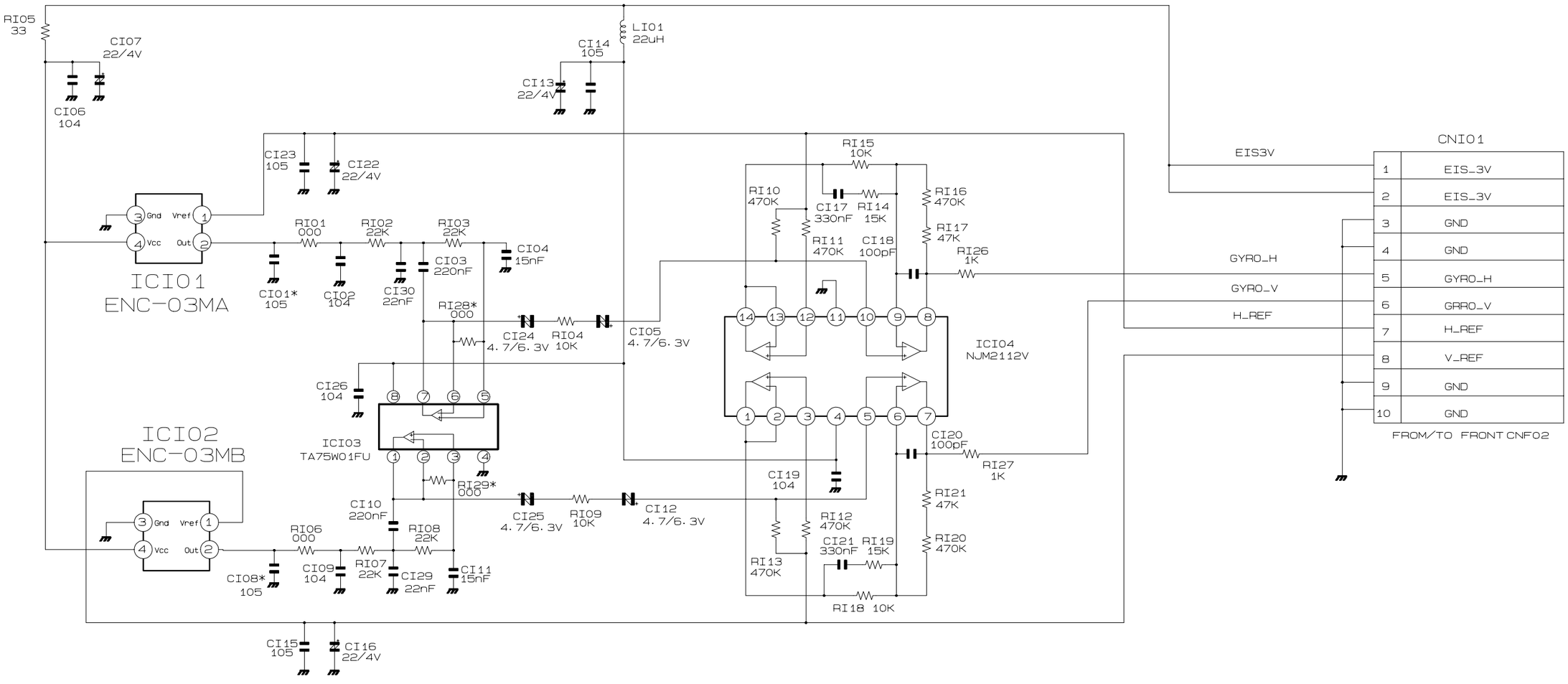
11-11 Function (Function PCB)



11-12 LCD (LCD PCB)



11-13 EIS



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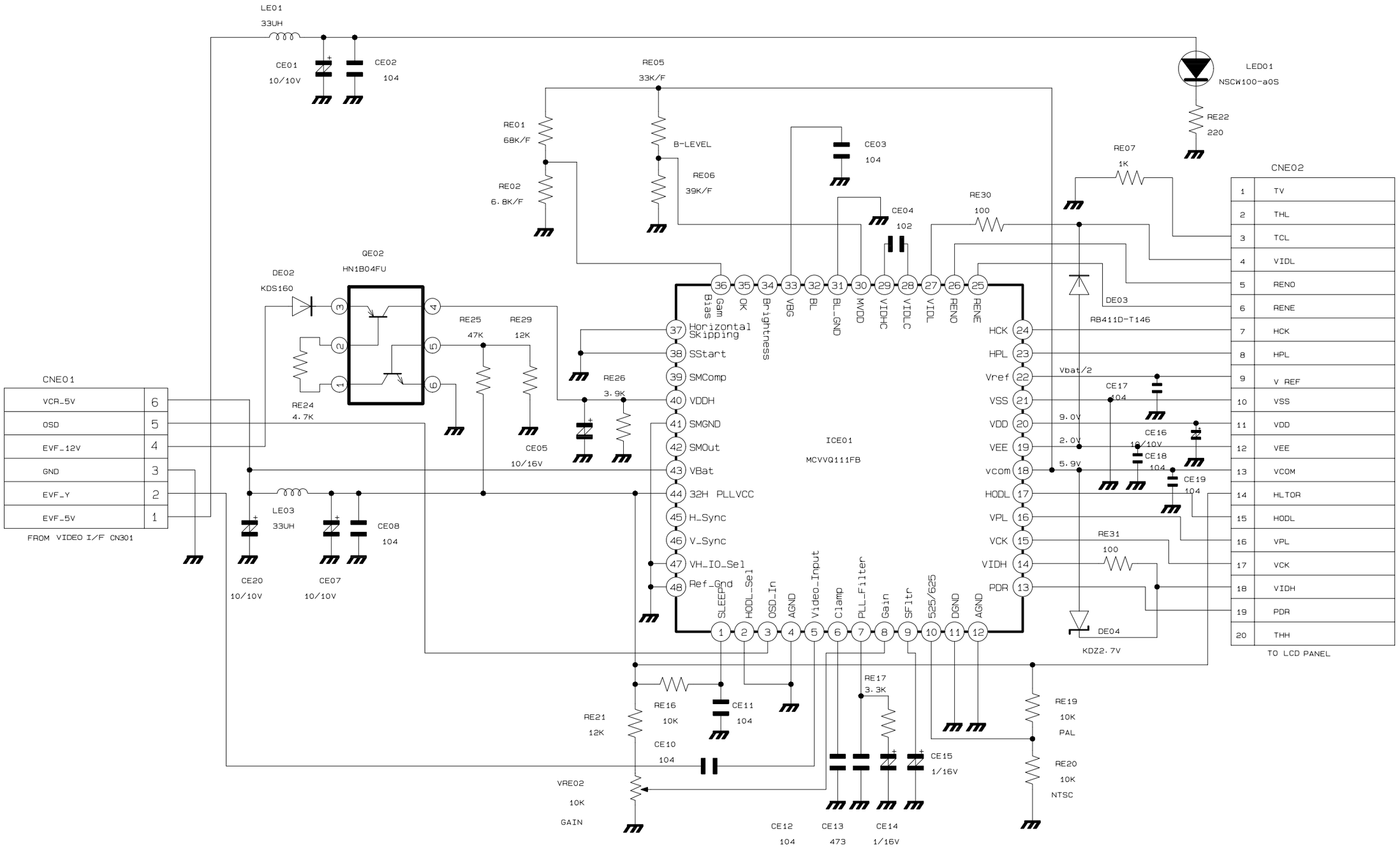
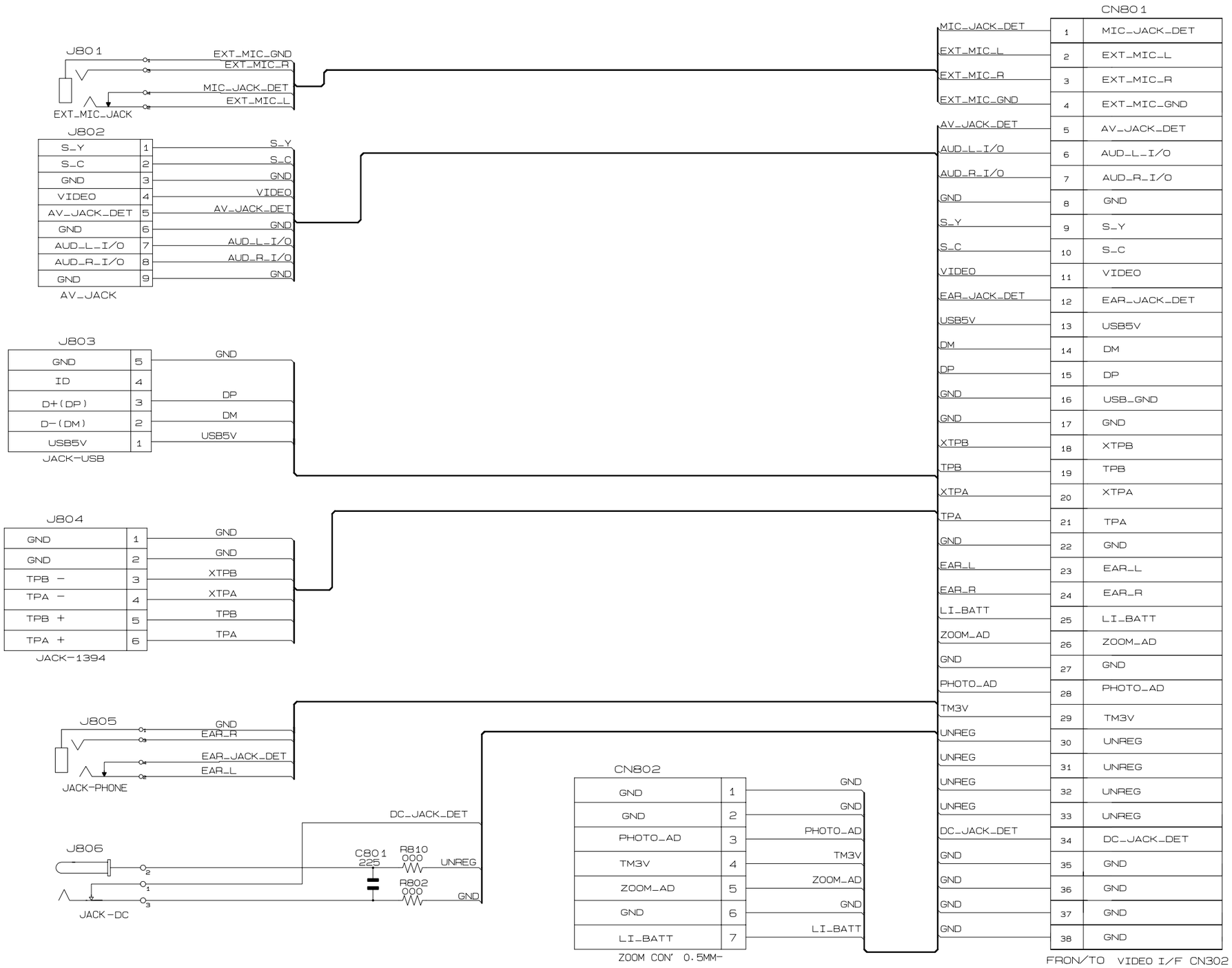
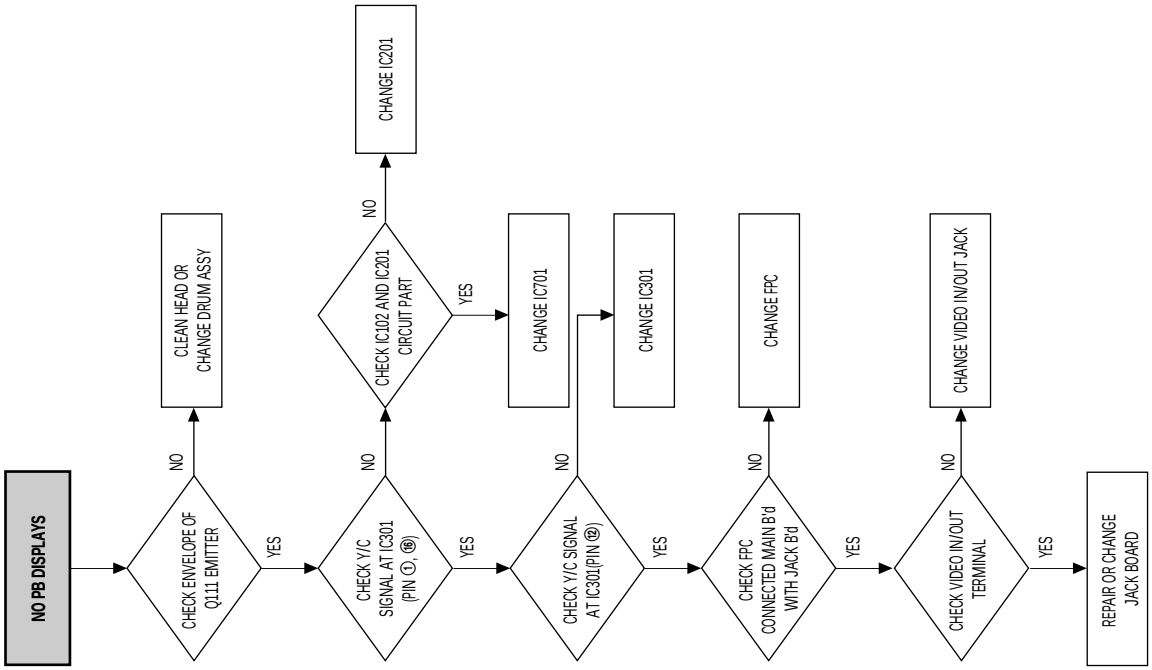
11-14 EVF

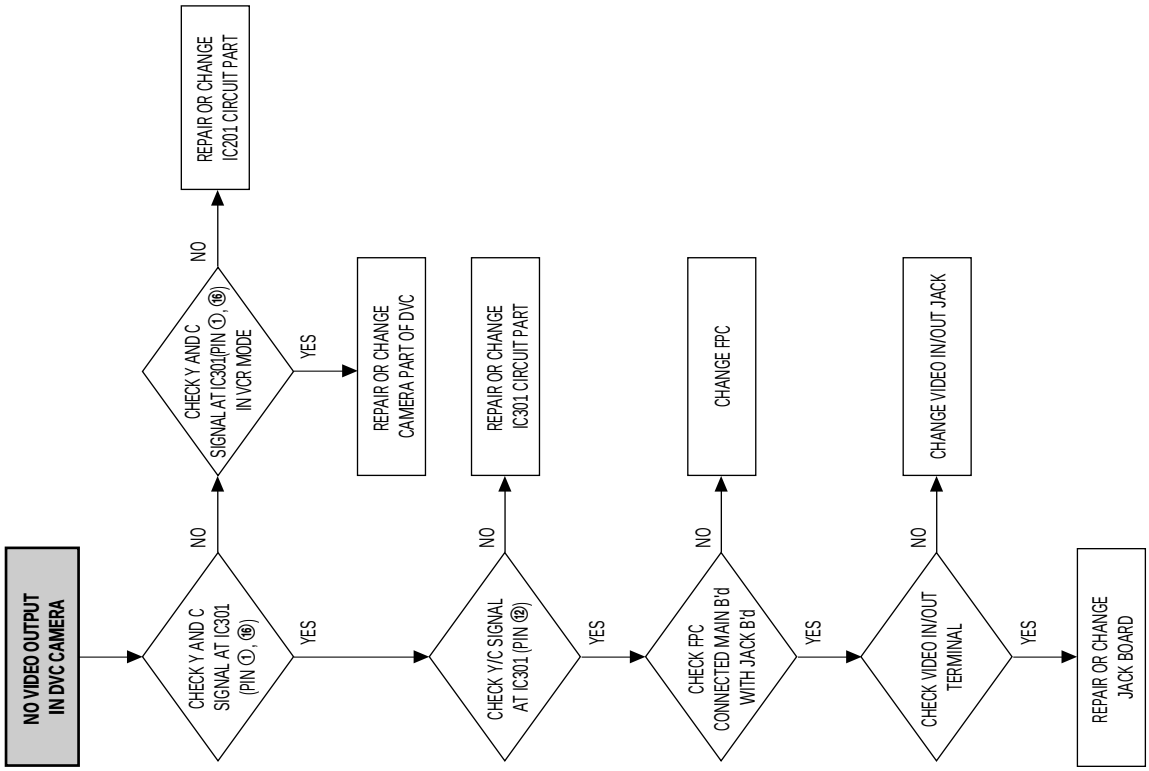

LE01
33UH
CE01
10/10V
CE02
104
RE05
33K/F
RE01
68K/F
RE02
6.8K/F
B-LEVEL
RE06
39K/F
CE03
104
CE04
102
RE30
100
RE07
1K
LED01
NSCW100-a0S
RE22
220
CNE02
1 TV
2 THL
3 TCL
4 VIDL
5 RENO
6 RENE
7 HCK
8 HPL
9 V_REF
10 VSS
11 VDD
12 VEE
13 VCOM
14 HLTOR
15 HODL
16 VPL
17 VCK
18 VIDH
19 PDR
20 THH
TO LCD PANEL
QE02
HN1B04FU
DE02
KDS160
DE03
RB411D-T146
DE04
KDZ2.7V
RE25
47K
RE29
12K
RE24
4.7K
RE26
3.9K
CE05
10/16V
CNE01
VCR_5V 6
OSD 5
EVF_12V 4
GND 3
EVF_Y 2
EVF_5V 1
FROM VIDEO I/F CN301
LE03
33UH
CE20
10/10V
CE07
10/10V
CE08
104
ICE01
MCVVQ111FB
36 Gam Bias
35 OK
34 Brightness
33 VBG
32 BL
31 BL_GND
30 MVDD
29 VIDHC
28 VIDLC
27 VIDL
26 RENO
25 RENE
37 Horizontal Skipping
38 SStart
39 SMComp
40 VDDH
41 SMGND
42 SMOut
43 VBat
44 32H PLLVCC
45 H_Sync
46 V_Sync
47 VH_IO_Sel
48 Ref_Gnd
HCK 24
HPL 23
Vref 22
VSS 21
VDD 20
VEE 19
vcom 18
HODL 17
VPL 16
VCK 15
VIDH 14
PDR 13
Vbat/2
9.0V
2.0V
5.9V
CE17
104
CE16
10/10V
CE18
104
CE19
104
RE31
100
1 SLEEP
2 HODL_Sel
3 OSD_In
4 AGND
5 Video_Input
6 Clamp
7 PLL_Filter
8 Gain
9 SFltr
10 525/625
11 DGND
12 AGND
RE16
10K
CE11
104
RE21
12K
CE10
104
VRE02
10K
GAIN
RE17
3.3K
CE15
1/16V
CE12
104
CE13
473
CE14
1/16V
RE19
10K
PAL
RE20
10K
NTSC

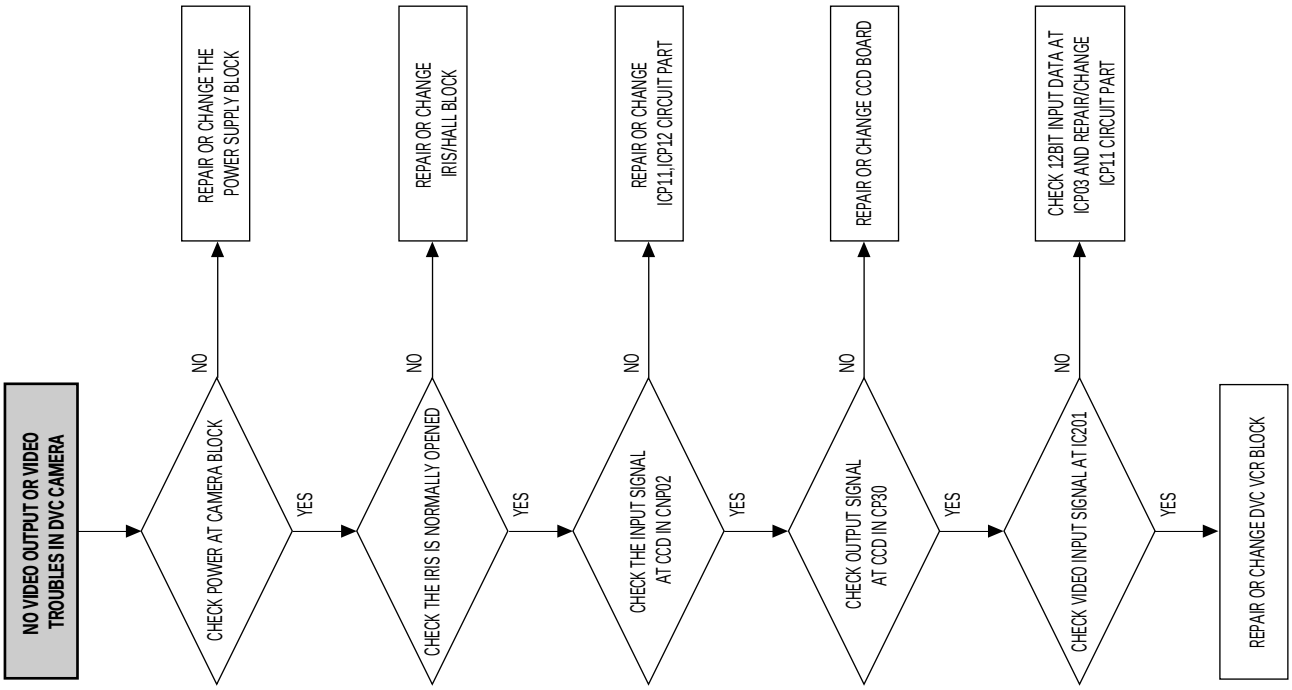
11-15 Jack (Jack PCB)

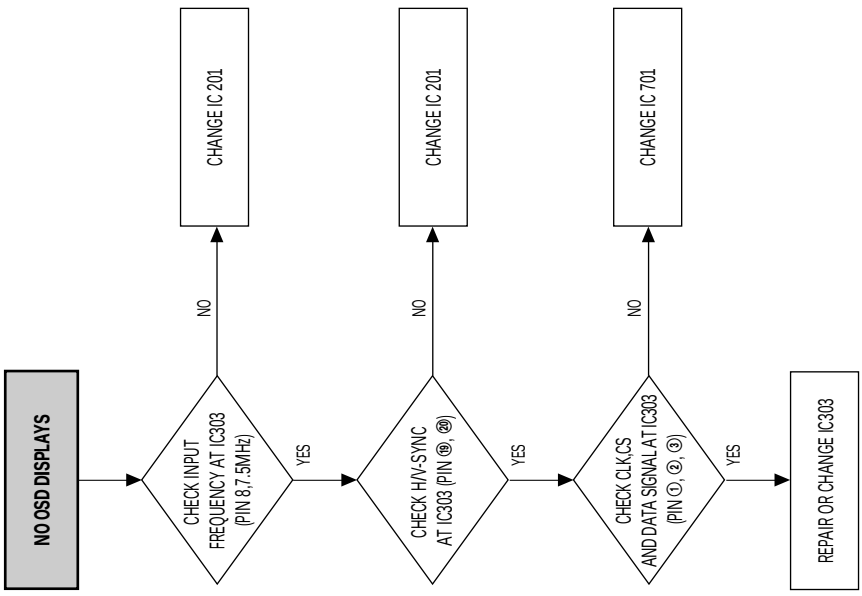


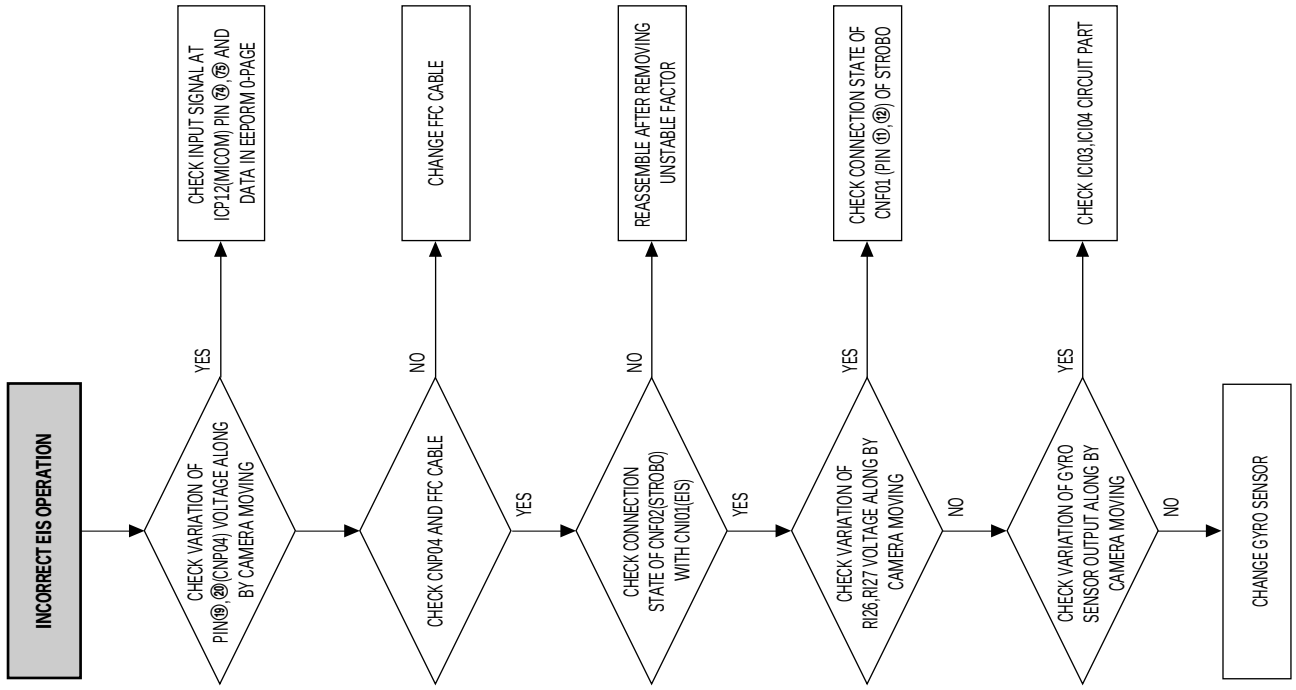
8. Troubleshooting

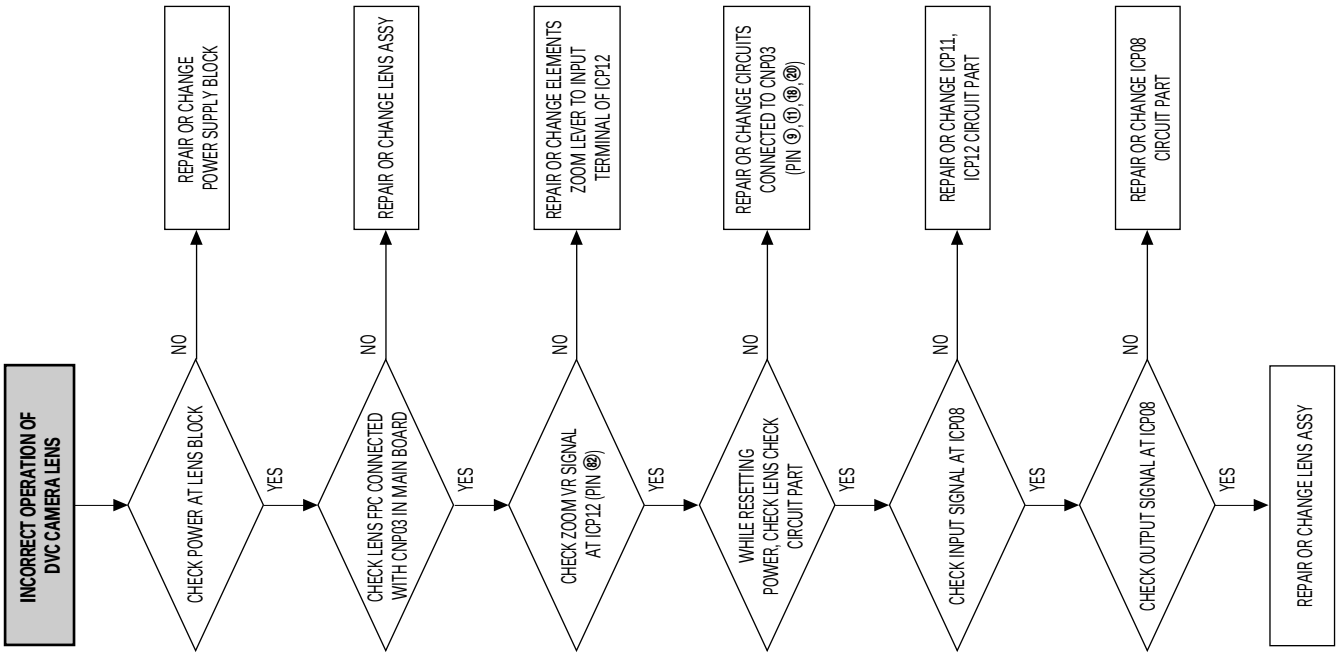


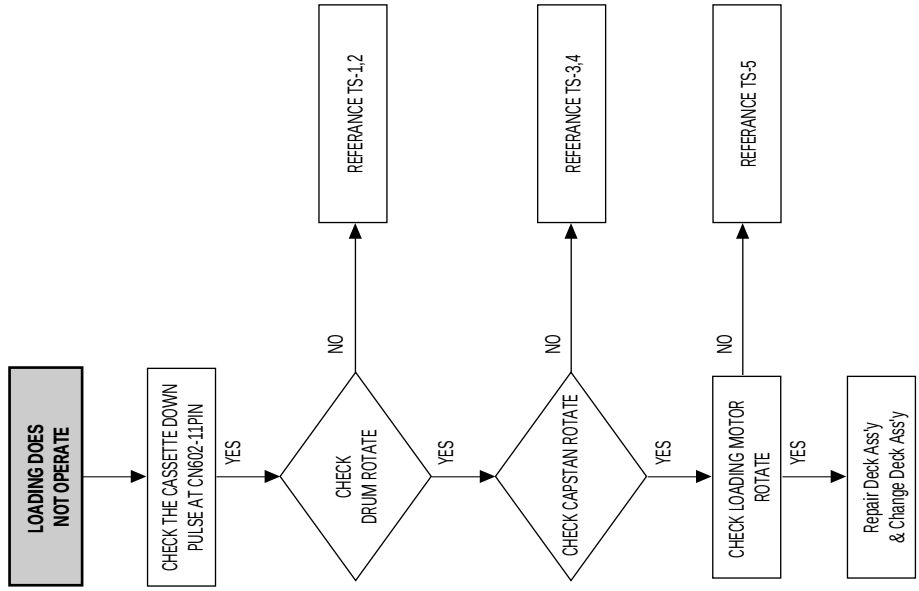

NO VIDEO OUTPUT IN DVC CAMERA
CHECK Y AND C SIGNAL AT IC301 (PIN ①, ⑯)
NO
CHECK Y AND C SIGNAL AT IC301(PIN ①, ⑯) IN VCR MODE
NO
REPAIR OR CHANGE IC201 CIRCUIT PART
YES
REPAIR OR CHANGE CAMERA PART OF DVC
YES
CHECK Y/C SIGNAL AT IC301 (PIN ⑫)
NO
REPAIR OR CHANGE IC301 CIRCUIT PART
YES
CHECK FPC CONNECTED MAIN B'd WITH JACK B'd
NO
CHANGE FPC
YES
CHECK VIDEO IN/OUT TERMINAL
NO
CHANGE VIDEO IN/OUT JACK
YES
REPAIR OR CHANGE JACK BOARD

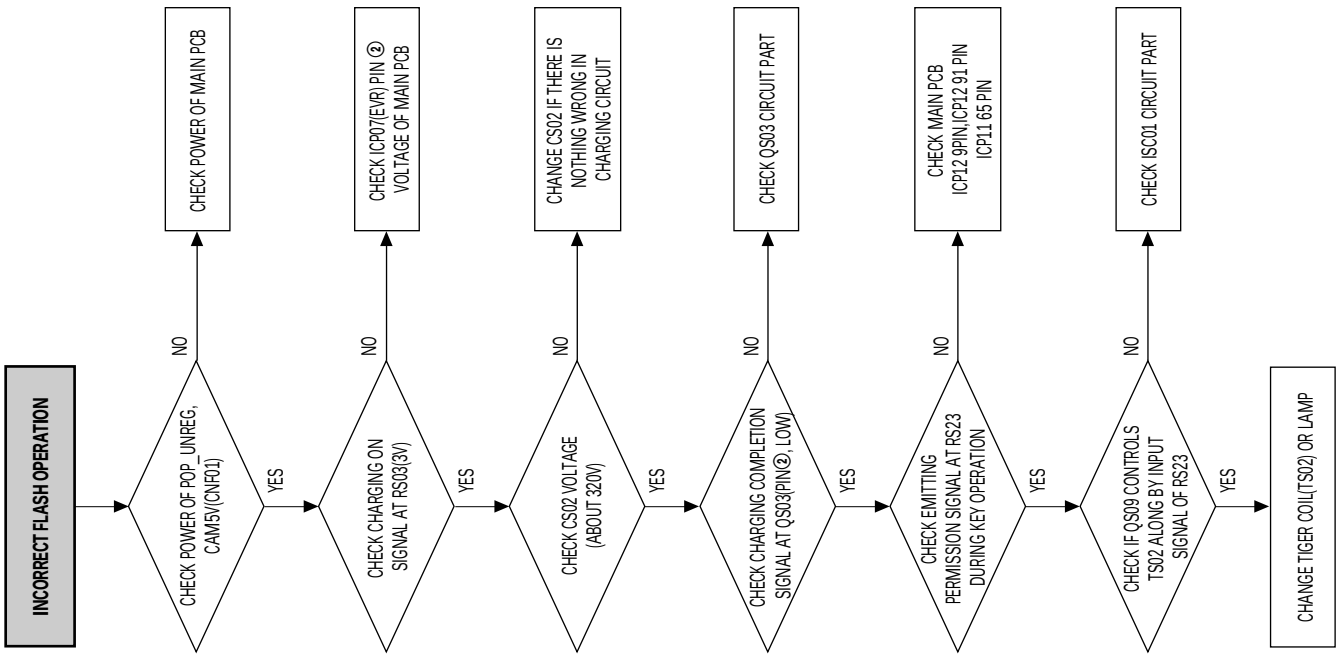

NO VIDEO OUTPUT OR VIDEO TROUBLES IN DVC CAMERA
CHECK POWER AT CAMERA BLOCK
NO
REPAIR OR CHANGE THE POWER SUPPLY BLOCK
YES
CHECK THE IRIS IS NORMALLY OPENED
NO
REPAIR OR CHANGE IRIS/HALL BLOCK
YES
CHECK THE INPUT SIGNAL AT CCD IN CNP02
NO
REPAIR OR CHANGE ICP11,ICP12 CIRCUIT PART
YES
CHECK OUTPUT SIGNAL AT CCD IN CP30
NO
REPAIR OR CHANGE CCD BOARD
YES
CHECK VIDEO INPUT SIGNAL AT IC201
NO
CHECK 12BIT INPUT DATA AT ICP03 AND REPAIR/CHANGE ICP11 CIRCUIT PART
YES
REPAIR OR CHANGE DVC VCR BLOCK

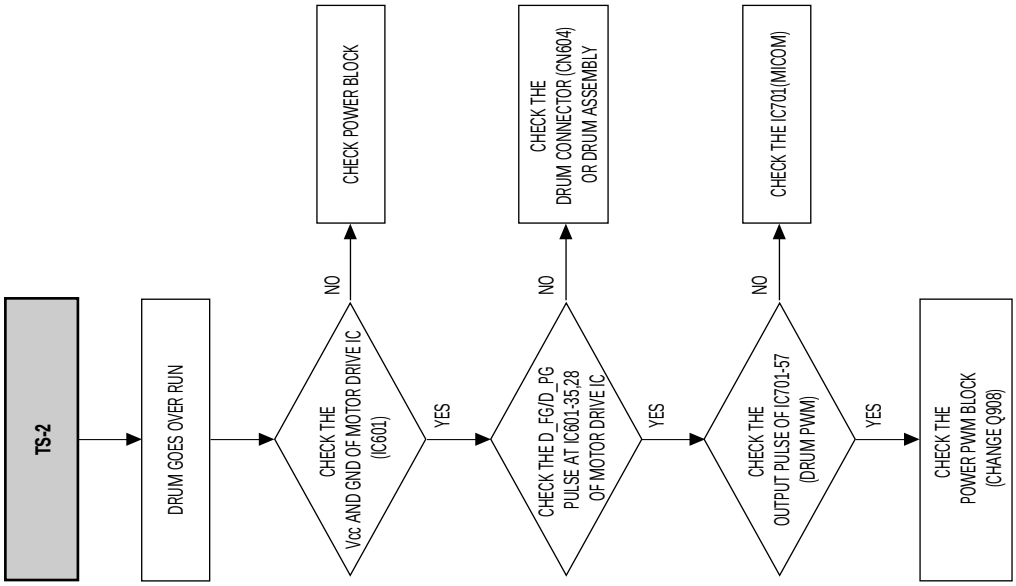

NO OSD DISPLAYS
CHECK INPUT FREQUENCY AT IC303 (PIN 8,7.5MHz)
NO
CHANGE IC 201
YES
CHECK H/V-SYNC AT IC303 (PIN ⑱, ⑳)
NO
CHANGE IC 201
YES
CHECK CLK,CS AND DATA SIGNAL AT IC303 (PIN ①, ②, ③)
NO
CHANGE IC 701
YES
REPAIR OR CHANGE IC303

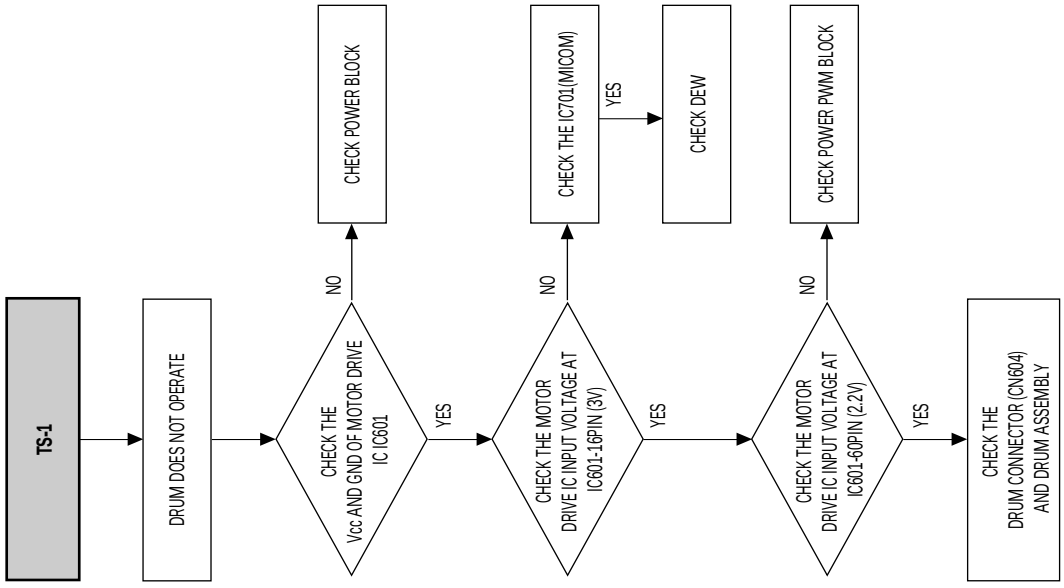

INCORRECT EIS OPERATION
CHECK VARIATION OF PIN⑲,⑳(CNP04) VOLTAGE ALONG BY CAMERA MOVING
YES
CHECK INPUT SIGNAL AT ICP12(MICOM) PIN ㉕,㉖ AND DATA IN EEPORM 0-PAGE
NO
CHECK CNP04 AND FFC CABLE
YES
CHANGE FFC CABLE
NO
CHECK CONNECTION STATE OF CNF02(STROBO) WITH CN104(EIS)
YES
REASSEMBLE AFTER REMOVING UNSTABLE FACTOR
NO
CHECK VARIATION OF R126,R127 VOLTAGE ALONG BY CAMERA MOVING
YES
CHECK CONNECTION STATE OF CNF01 (PIN ⑪,⑫) OF STROBO
NO
CHECK VARIATION OF GYRO SENSOR OUTPUT ALONG BY CAMERA MOVING
YES
CHECK IC103,IC104 CIRCUIT PART
NO
CHANGE GYRO SENSOR

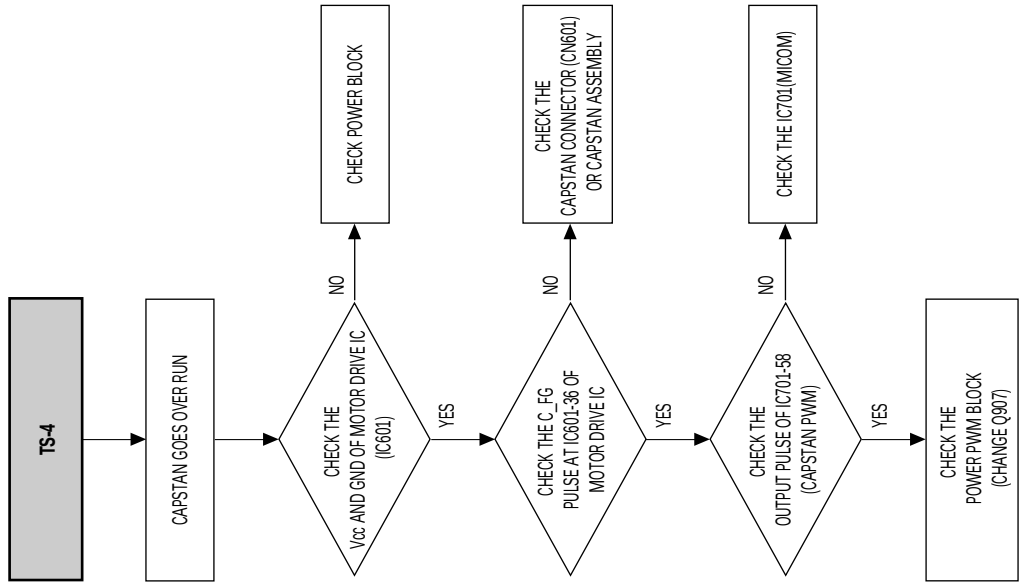

INCORRECT OPERATION OF DVC CAMERA LENS
CHECK POWER AT LENS BLOCK
NO
REPAIR OR CHANGE POWER SUPPLY BLOCK
YES
CHECK LENS FPC CONNECTED WITH CNP03 IN MAIN BOARD
NO
REPAIR OR CHANGE LENS ASSY
YES
CHECK ZOOM VR SIGNAL AT ICP12 (PIN ㉒)
NO
REPAIR OR CHANGE ELEMENTS ZOOM LEVER TO INPUT TERMINAL OF ICP12
YES
WHILE RESETTING POWER, CHECK LENS CHECK CIRCUIT PART
NO
REPAIR OR CHANGE CIRCUITS CONNECTED TO CNP03 (PIN ⑨,⑪,⑱,⑳)
YES
CHECK INPUT SIGNAL AT ICP08
NO
REPAIR OR CHANGE ICP11, ICP12 CIRCUIT PART
YES
CHECK OUTPUT SIGNAL AT ICP08
NO
REPAIR OR CHANGE ICP08 CIRCUIT PART
YES
REPAIR OR CHANGE LENS ASSY

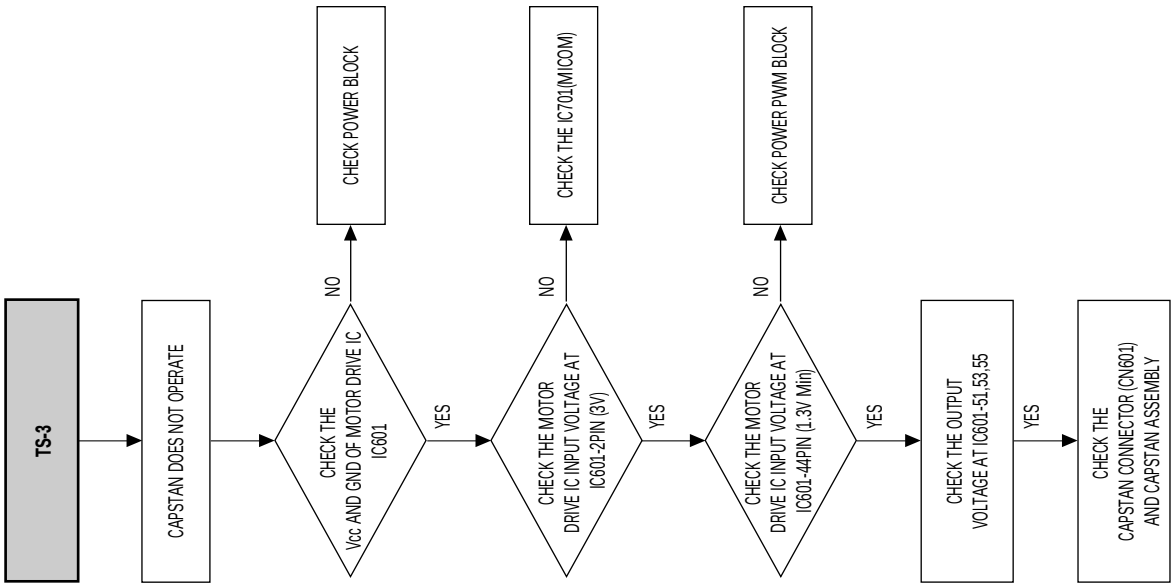

LOADING DOES NOT OPERATE
CHECK THE CASSETTE DOWN PULSE AT CN602-11PIN
YES
CHECK DRUM ROTATE
NO
REFERANCE TS-1,2
YES
CHECK CAPSTAN ROTATE
NO
REFERANCE TS-3,4
YES
CHECK LOADING MOTOR ROTATE
NO
REFERANCE TS-5
YES
Repair Deck Ass'y & Change Deck Ass'y

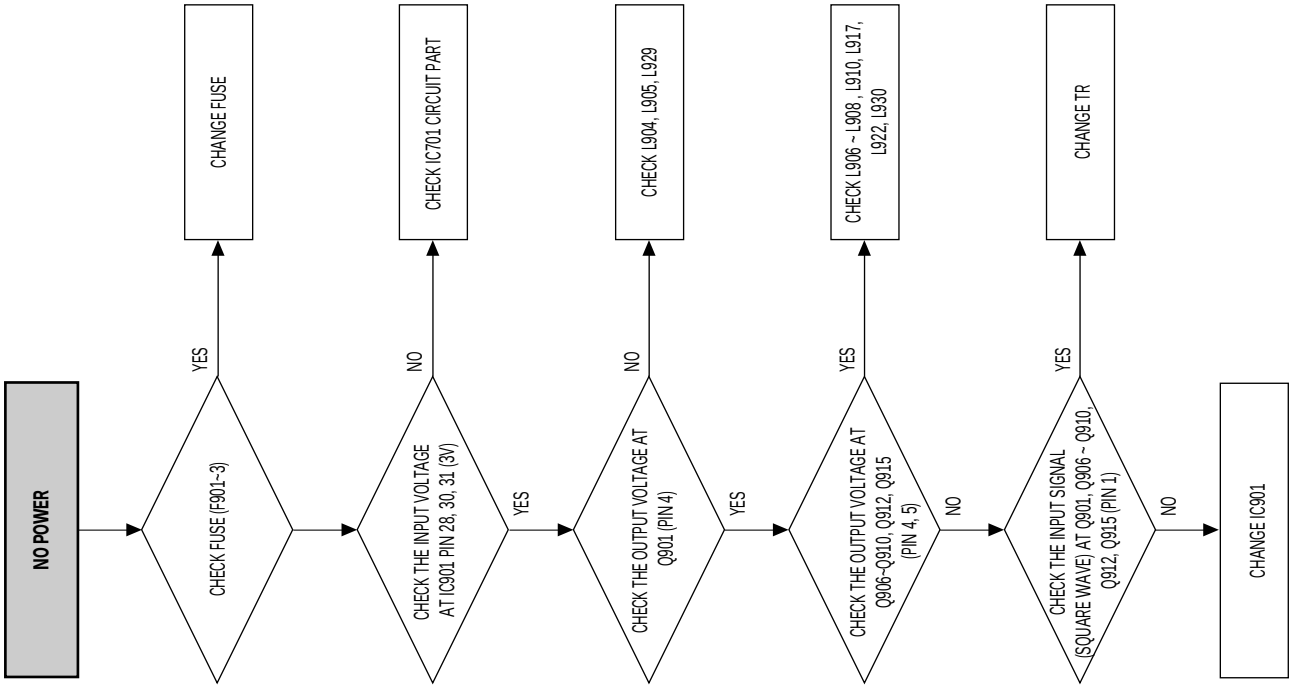

INCORRECT FLASH OPERATION
CHECK POWER OF POP_UNREG, CAM5V(CNR01)
NO
CHECK POWER OF MAIN PCB
YES
CHECK CHARGING ON SIGNAL AT RS03(3V)
NO
CHECK ICP07(EVR) PIN ② VOLTAGE OF MAIN PCB
YES
CHECK CS02 VOLTAGE (ABOUT 320V)
NO
CHANGE CS02 IF THERE IS NOTHING WRONG IN CHARGING CIRCUIT
YES
CHECK CHARGING COMPLETION SIGNAL AT QS03(PIN②, LOW)
NO
CHECK QS03 CIRCUIT PART
YES
CHECK EMITTING PERMISSION SIGNAL AT RS23 DURING KEY OPERATION
NO
CHECK MAIN PCB ICP12 9PIN,ICP12 91 PIN ICP11 65 PIN
YES
CHECK IF QS09 CONTROLS TS02 ALONG BY INPUT SIGNAL OF RS23
NO
CHECK ISC01 CIRCUIT PART
YES
CHANGE TIGER COIL(TS02) OR LAMP

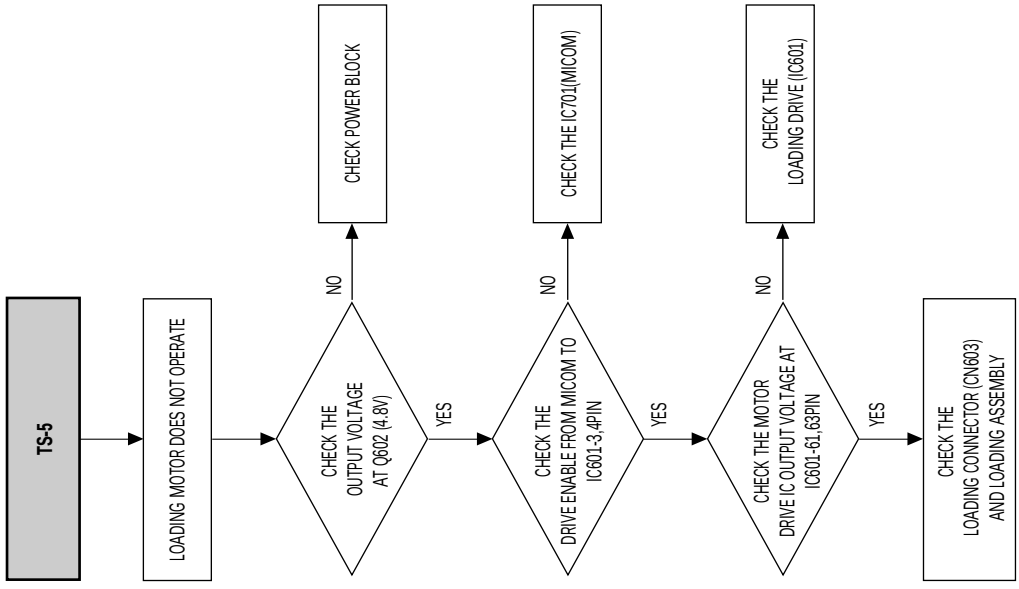

TS-2
DRUM GOES OVER RUN
CHECK THE Vcc AND GND OF MOTOR DRIVE IC (IC601)
NO
CHECK POWER BLOCK
YES
CHECK THE D_FG/D_PG PULSE AT IC601-35,28 OF MOTOR DRIVE IC
NO
CHECK THE DRUM CONNECTOR (CN604) OR DRUM ASSEMBLY
YES
CHECK THE OUTPUT PULSE OF IC701-57 (DRUM PWM)
NO
CHECK THE IC701(MICOM)
YES
CHECK THE POWER PWM BLOCK (CHANGE Q908)

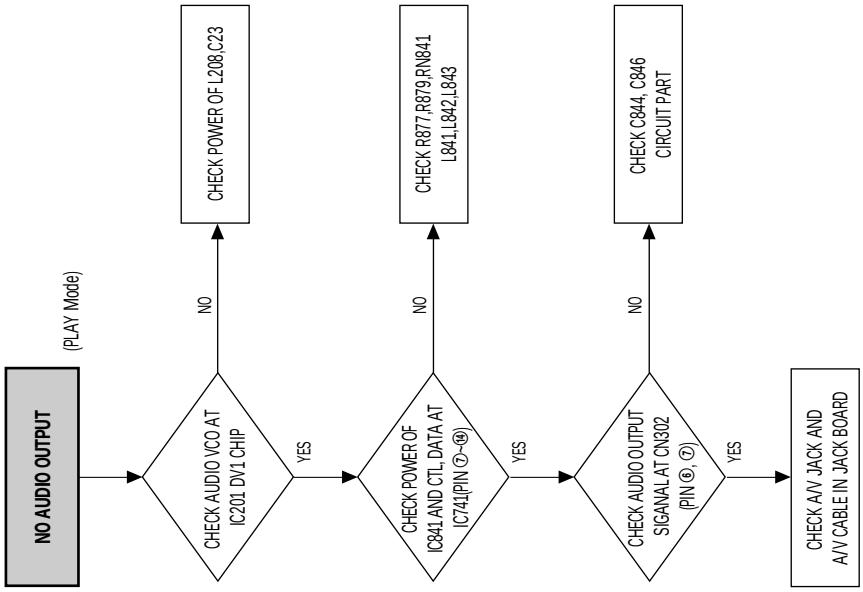

TS-1
DRUM DOES NOT OPERATE
CHECK THE Vcc AND GND OF MOTOR DRIVE IC IC601
NO
CHECK POWER BLOCK
YES
CHECK THE MOTOR DRIVE IC INPUT VOLTAGE AT IC601-16PIN (3V)
NO
CHECK THE IC701(MICOM)
YES
CHECK DEW
YES
CHECK THE MOTOR DRIVE IC INPUT VOLTAGE AT IC601-60PIN (2.2V)
NO
CHECK POWER PWM BLOCK
YES
CHECK THE DRUM CONNECTOR (CN604) AND DRUM ASSEMBLY

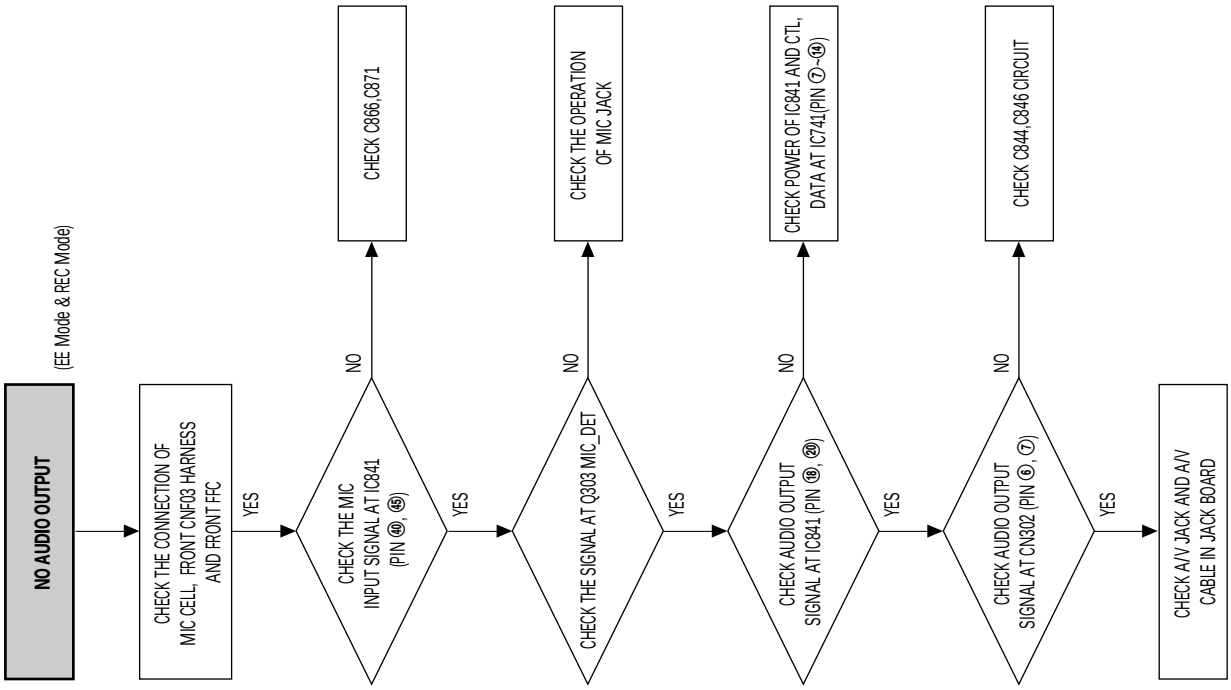

TS-4
CAPSTAN GOES OVER RUN
CHECK THE Vcc AND GND OF MOTOR DRIVE IC (IC601)
NO
CHECK POWER BLOCK
YES
CHECK THE C_FG PULSE AT IC601-36 OF MOTOR DRIVE IC
NO
CHECK THE CAPSTAN CONNECTOR (CN601) OR CAPSTAN ASSEMBLY
YES
CHECK THE OUTPUT PULSE OF IC701-58 (CAPSTAN PWM)
NO
CHECK THE IC701(MICOM)
YES
CHECK THE POWER PWM BLOCK (CHANGE Q907)


TS-3
CAPSTAN DOES NOT OPERATE
CHECK THE Vcc AND GND OF MOTOR DRIVE IC IC601
NO
CHECK POWER BLOCK
YES
CHECK THE MOTOR DRIVE IC INPUT VOLTAGE AT IC601-2PIN (3V)
NO
CHECK THE IC701(MICOM)
YES
CHECK THE MOTOR DRIVE IC INPUT VOLTAGE AT IC601-44PIN (1.3V Min)
NO
CHECK POWER PWM BLOCK
YES
CHECK THE OUTPUT VOLTAGE AT IC601-51,53,55
YES
CHECK THE CAPSTAN CONNECTOR (CN601) AND CAPSTAN ASSEMBLY

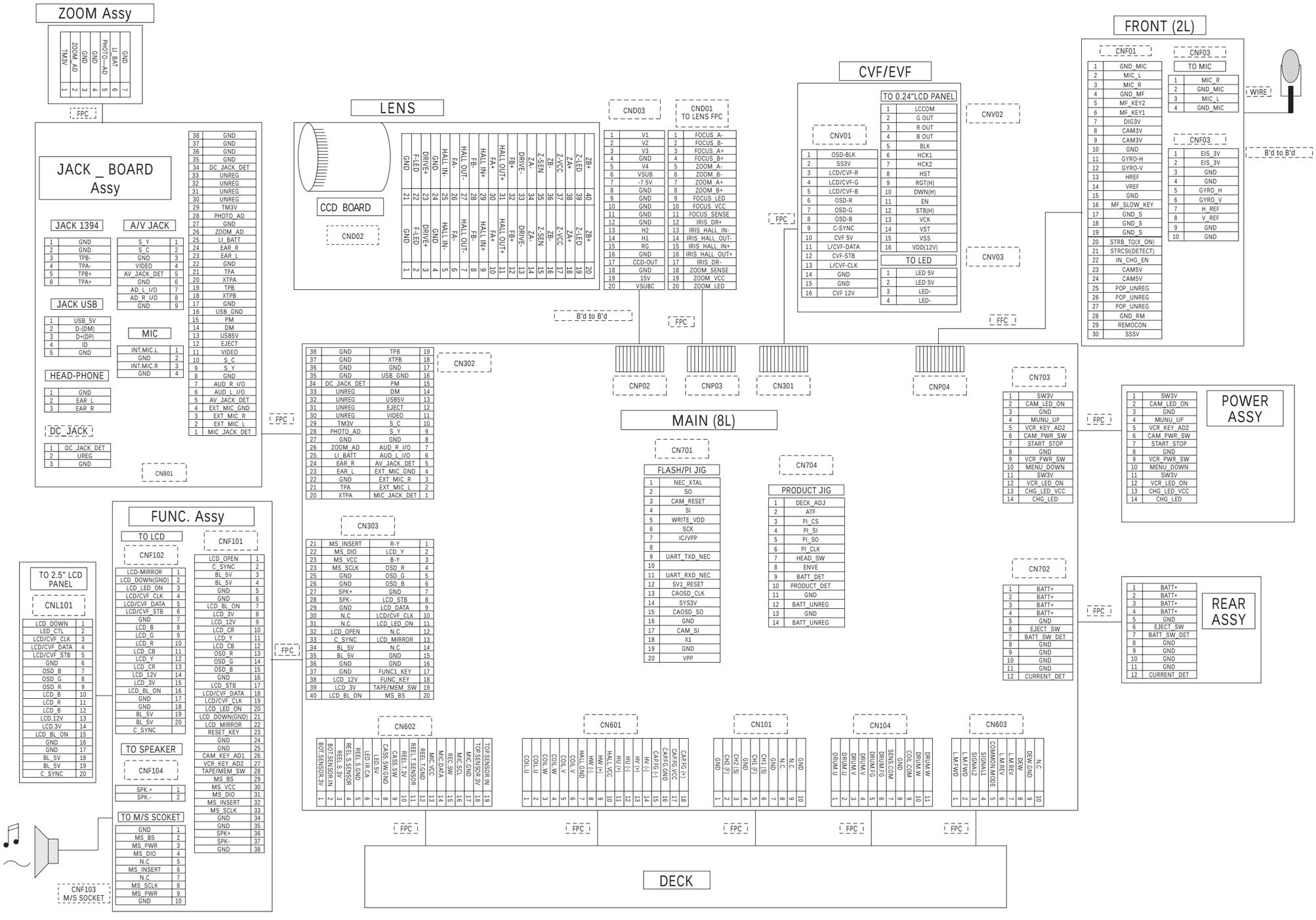

NO POWER
CHECK FUSE (F901~3)
YES
CHANGE FUSE
CHECK THE INPUT VOLTAGE AT IC901 PIN 28, 30, 31 (3V)
NO
CHECK IC701 CIRCUIT PART
YES
CHECK THE OUTPUT VOLTAGE AT Q901 (PIN 4)
NO
CHECK L904, L905, L929
YES
CHECK THE OUTPUT VOLTAGE AT Q906~Q910, Q912, Q915 (PIN 4, 5)
YES
CHECK L906 ~ L908, L910, L917, L922, L930
NO
CHECK THE INPUT SIGNAL (SQUARE WAVE) AT Q901, Q906 ~ Q910, Q912, Q915 (PIN 1)
YES
CHANGE TR
NO
CHANGE IC901


TS-5
LOADING MOTOR DOES NOT OPERATE
CHECK THE OUTPUT VOLTAGE AT Q602 (4.8V)
NO
CHECK POWER BLOCK
YES
CHECK THE DRIVE ENABLE FROM MICOM TO IC601-3,4PIN
NO
CHECK THE IC701(MICOM)
YES
CHECK THE MOTOR DRIVE IC OUTPUT VOLTAGE AT IC601-61,63PIN
NO
CHECK THE LOADING DRIVE (IC601)
YES
CHECK THE LOADING CONNECTOR (CN603) AND LOADING ASSEMBLY


NO AUDIO OUTPUT
(PLAY Mode)
CHECK AUDIO VCO AT IC201 DV1 CHIP
NO
CHECK POWER OF L208,C23
YES
CHECK POWER OF IC841 AND CTL DATA AT IC741(PIN ⑦~⑭)
NO
CHECK R877,R879,RN841 L841,L842,L843
YES
CHECK AUDIO OUTPUT SIGANAL AT CN302 (PIN ⑥, ⑦)
NO
CHECK C844, C846 CIRCUIT PART
YES
CHECK A/V JACK AND A/V CABLE IN JACK BOARD


NO AUDIO OUTPUT
(EE Mode & REC Mode)
CHECK THE CONNECTION OF MIC CELL, FRONT CNF03 HARNESS AND FRONT FFC
YES
CHECK THE MIC INPUT SIGNAL AT IC841 (PIN ㊵, ㊶)
NO
CHECK C866,C871
YES
CHECK THE SIGNAL AT Q303 MIC_DET
NO
CHECK THE OPERATION OF MIC JACK
YES
CHECK AUDIO OUTPUT SIGNAL AT IC841 (PIN ⑱, ⑳)
NO
CHECK POWER OF IC841 AND CTL, DATA AT IC741(PIN ⑦~⑭)
YES
CHECK AUDIO OUTPUT SIGNAL AT CN302 (PIN ⑥, ⑦)
NO
CHECK C844,C846 CIRCUIT
YES
CHECK A/V JACK AND A/V CABLE IN JACK BOARD

10. Wiring Diagram



MEMO